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Cereal chaff used as a temper in a loam-weight: new evidence from a Slovenian Late Neolithic pile-dwelling site

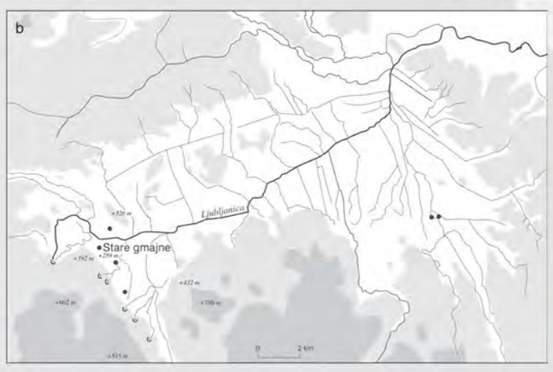
Authors: Tjaša Tolar[1], Anton Velušček[1], Janez Dirjec[1] and Stefanie Jacomet[2]

[1] ZRC SAZU, Institute of Archaeology, Novi trg 2, 1000 Ljubljana, Slovenia
[2] University of Basel, IPNA, Spalenring 145, 4055 Basel, Switzerland

The site and the object of the research

Stare gmajne, Late Neolithic pile-dwelling site (app. 3160 – 3100 cal BC) was first excavated in 2006 (photo: M. Turk). Stare gmajne is one of cca. 40 pile-dwelling sites discovered at Ljubljansko barje (Slovenia), where also one of the oldest wooden wheels with an axle was found (more info: Velušček 2009).







Large (22 cm high and up to 14.4 cm wide) pyramid-shaped loam-weight was found at Stare gmajne. The wall of the weight was burnt, but its inside not completely. The interior unburnt clayey material was dug out and wet-sieved across 2 mm and 0.355 mm mesh size sieves.





Conclusions

- new evidence of an intentional use of cereal by-products at Late Neolithic pile-dwelling site in Slovenia was detected, i. e. using cereal chaff as a temper for a loam-weight
- the original material (unburnt clay including large quantities of chaff) for making the weight was gained inside the object and analysed
- it was possible to identify the actual quantity and variety of straw and chaff used for tempering (see Tabs. 1 and 2), which is, according to our knowledge, the first time in the history of archaeobotany: more than 1600 carbonised and half-carbonised identifiable cereal macroremains in less than 1 litre of sediment were sorted and counted
- cultivation of the main crops (emmer, einkorn and barley) at Slovenian late Neolithic pile-dwelling sites was confirmed again (see: Tolar et al. 2011)
- among the chaff, new unusual "strange" type of emmer spikelet forks was discovered
- an experiment was made in order to reconstruct how the chaff became half-charred and charred inside the weight although only outer parts were fired. Most probably, the temperatures were high enough (and the oxygen-content very low) to carbonise the temper material inside the weight, but not high enough to burn the clay. As Jacomet et al. 2002 have found during another experiment, temp. of 150-200 °C lasting over several hours, can lead to a complete charring and excellent preservation

References:

- Velušček A. (ed) (2009) Stare gmajne pile-dwelling settlement and its era. Opera Instituti Archaeologici Sloveniae 16. Založba ZRC, Ljubljana. 330 pp.
- Tolar T., Jacomet S., Velušček A., Čufar K. (2011) Plant economy at a Late Neolithic lake dwelling site in Slovenia at the time of the Alpine Iceman. Veg Hist Archaeobot 20: 207-222.
- Jacomet S., Kučan D., Ritter A., Suter G., Hagendorn A. (2002) *Punica granatum* (pomegranates) from early Roman contexts in Vindonissa (Switzerland). Veg Hist Archaeobot 11: 79-92.

Results

Under stereomicroscope, plant macrofossils (mostly cereal straw and chaff) used as a temper were recognized.





The impressions of plant macroremains on a fragment of the burnt wall of the weight (photo: D. Valoh).



Numerous carbonised and half-carbonised cereal by-products were exceptionally well preserved in the unburnt, central part of the loam-weight, which was protected from post-depositional influences.

Tab. 1: Absolute numbers (counts) and percentages of carbonised vs. half-carbonised identifiable cereal macroremains (CM) (see Tab. 2) in cca. 1 litre of clayey (unburnt) material.

carbonised CM	1,308	77.50 %
half-carbonised CM	380	22.50 %
sum	1,688	



Among identifiable CM barley (*Hordeum vulgare*) rachis fragments (Fig. a) and glume wheat (emmer (*Triticum dicoccum*)(Fig. b) and einkorn (*T. monococcum*) (Fig. c)) chaff remains prevailed (see Tab. 2).

Cereal by-products prevailed (Tab. 2), other plant macroremains (seeds / fruits of different taxa) were recognised as well: Poaceae fam. (incl. *Bromus* and *Panicum* cf.), *Papaver somniferum*, *Chenopodium album*, *Verbascum* cf. *blattaria*, *Hypericum perforatum*, *Quercus* sp., Cyperaceae fam., besides: Fungus spores, charcoal frg., fish bones and scales.

Tab. 2: Absolute no. (counts) of CM (cereal macroremains) in cca. 1 litre of clayey material.

CM	*H. vulgare*-naked	*T. dicoccum*	*T. monococcum*	*T. mono/dicoccum*
rachis frg.	443			25
grain	8	12		3
spikelet fork		238	89	74
rachis frg. with spikelet fork		24	11	
rachis frg. with 1 glume base		9		4
1 glume base		321	44	396

"Strange" type of emmer spikelet fork was recognized (Figs. a, b). It looks like an exceptionally big, maybe 3-grained emmer variety.



Fig. c: The right side represents the "typical dicoccums" and the left side the "strange" ones.