
Experiments across disciplines: unfolding starchy plants processing with pebble tools during the EUP in the Eurasian Steppe.

Laura Longo^{*†1}, Elena Badetti¹, Giovanni Birarda², Clarissa Cagnato³, Ana Tetrushvili⁴, and Giusi Sorrentino⁵

¹DAIS Department of Environmental Sciences, Informatics and Statistics, Ca' Foscari University of Venice, Italy – Italie

²Elettra-Sincrotrone Trieste, S.S. 14 - km 163,5 in AREA Science Park, 34149 Basovizza, Trieste Italy – Italie

³Aix-Marseille Université, UMR 7268 – ADES, Anthropologie bioculturelle, France – UMR 7268 – France

⁴Archaeology Department, Tbilisi State University, Georgia – États-Unis

⁵Department of Physics, University of Turin, Italy – Italie

Résumé

Starch grains represent the most direct evidence for dietary carbohydrates use, yet they remain undervalued for reconstructing food strategies before crops domestication. Artefacts intentionally used to transform starchy plants into calorific food are scattered and precious. The residues of soft plants starch-rich storage organs (PSRSO) – transformed into flour – still adhering to the utilized areas of ground stones used by early Homo sapiens during Eurasia colonization more than 40 ka BP, are even more rare. The proposed contribution refers to the combined analysis of both starch grains processed by grinding stones and those prepared in the lab to build reference collections for plant processing during early Upper Palaeolithic. The archaeological test cases were based on pebbles tools retrieved in several EUP sites across the Eurasian Steppe dating 38-25 ka cal BP. The experiments were devoted to address different questions although all revolved around the main research question: what plants were processed with pebble stones and what for. In second instance, the experiments aimed at reproducing – under controlled conditions – the transformation occurring to both starch grains and to the surfaces of the pebble stones. Our risk-hypothesis is that crevices – on the rocks uneven surfaces – may have served as traps for the starches resulting from the artefact used for intentional grinding. It is also necessary to have a reference record to compare the data obtained for the characterization of starch grains from archaeological samples, since many of the plants in use during the period under investigation are not acknowledged among those of economic interest nowadays. The plants used for the experiments were selected among those with starchy organs – USOs (roots and tubers) and ASOs (seeds and shelled fruits) available across the Eurasian Steppe around 40 ka BP on the base of the literary review. These starch-rich organs were processed according to a devoted procedure in order to extract the starch grains to be characterized for their morphology (VLM and SEM) and for

*Intervenant

†Auteur correspondant: laura.longo@unive.it

their content in fatty acids (GC-MS) to provide proxies at both morphological and physical-chemical level to identify plants with putative nutritional value available during MIS 3. The experiment design includes: 1) the pre-treatment of the stones used to process the targeted plants in order to breakdown any biogenic charge on the stone surface by means of different chemicals (solution of water and HCl, H₂O₂, NaClO) and through sonication; 2) samples from each stage were taken verify the resistance of putative biogenic contaminants; 3) at given time (from T0, not used, to T1, T2, T3, etc.) each step of the grinding was recorded through molding and residues removal. Different microscopies have been applied to identify: (i) raw materials (thin sections and metallographic microscope) for the selection of stones that mimicked the roughness of the archaeological tools, (ii) wear-traces obtained following a very strict utilization schedule on selected plants (by comparing OM, 3DM, and SEM), and (iii) starch grains (OM, SEM).

Mots-Clés: EUP Non, flaked industry, starchy, plants transformation, starch, experimental archaeology