Multistep food plant processing at Grotta Paglicci

Today the most common staple foods for human consumption consist of plant parts that contain significant amounts of energy-rich compounds, which are accumulated in the plants as energy resource. These compounds, produced by green plants through photosynthesis, are usually stored in the underground parts of the plants or within the stem. Energy-rich compounds are also abundant in seeds, where they are used as nourishment during the early development of the new plant. The most common form of energy-rich storage in plants is starch, a carbohydrate. These staple nutrients are generally not directly edible and they must be cooked either in their original form or after manipulation.

Paglicci grinding stone

Flour is the powdery substance made by grinding energy-rich plant parts for human consumption. Cassava flour, for example, comes from grinding the tuberous roots of the Brazilian arrowroot, while sago flour is made from the heart of the stem of sago palms and sago cycads. Numerous flours – such as wheat flour – are obtained by grinding cereal grains. During the grinding process, some of the starch grains are trapped in the friction tracks created on the surface of grinding tools

by constant use. Research on ancient grinding stones worldwide has shown that starch residues can be preserved for quite a long time, even tens of thousands of years. When preserved, starch grains can be tested to determine which plants were used by our ancestors to produce flour.

The occurrence of starch grains on the surface of Mid-Upper Paleolithic grinding stones recovered in Italy, Moravia and Russia, demonstrates that European populations were already capable of using appropriate tools for processing starchy plant parts and produce flour as early as 33,000-30,000 years ago. Flour is a dry product, long lasting and easily stored and was a vital resource, available all year long and effortlessly transportable, an important feature for nomadic hunter–gatherers such as Paleolithic populations.

More specifically, the discovery of oat starch grains on the grinding stone of the *Paglicci* cave in Southern Italy points to the employment of wild cereals.

For the most part, the starch grains discovered on the surface of the Paglicci grinding stone were swollen and gelatinized: their appearance strongly recalled that of cooked (toasted or baked) grains. Indeed, experimental tests confirmed that the oat grains presented features analogous to those treated with heat before grinding. This pre-grinding treatment was most likely performed in order to speed up the drying of the grains, so as to render grinding easier and faster. The heat treatment also facilitated the flour preservation and perhaps even caused the outer casing of the grains to flake off, making it easier – or even unnecessary – to eliminate chaff prior to grinding.

As the production of flour necessitated a challenging, time-consuming set of procedures, it also required proper skills. The traces on the surface of the grinding stones in Paglicci tell us that grains were gathered and heated, then crushed and ground into flour using the round tip of the stone as a pestle and the lateral side as a grinder. Subsequently, the resulting flour was likely mixed with water and cooked.

The multi-step process reveals the importance of exploiting vegetable resources for nutritional purposes in the Mid-Upper Paleolithic. The inhabitants of the Grotta Paglicci had developed specific technologies for the processing of plant parts before grinding: such skills would have been crucial in a period characterized by harsh climate. The starch found on the Paglicci grinding stone is currently the most ancient evidence of the processing of oat ever recorded.

Publication

Multistep food plant processing at Grotta Paglicci (Southern Italy) around 32,600 cal B.P.
Mariotti Lippi M, Foggi B, Aranguren B, Ronchitelli A, Revedin A
Proc Natl Acad Sci U S A. 2015 Sep 8. pii: 201505213