

# EXPERIMENTAL ARCHAEOLOGY AS A RESOURCE FOR APPROACHING FORMATION PROCESSES OF SEED ASSEMBLAGES. FIRST RESULTS.

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## The questions

- How does charring affect seed and fruit assemblages (not single items)?
- How do these assemblages respond when buried or when exposed to open air for a short time?
- Can different types of excavation and soil processing techniques affect the final representativity of an assemblage?

## Designing the experiment and the variables under study

Formation processes and the properties of artifacts have been defined by Schiffer (1983; 1991). How each formation process affects each property is still to be outlined for most of the archaeobotanical record. A systematic project of experimentations must be carried out to establish patterns that can be applied to the interpretation of the archaeobotanical record. This requires the definition of the variables under study and a seed-by-seed description. The concepts used, the system of description and the database follows previous works (Antolín and Buxó 2010).

**Variables under study:** type of depositional context (open-air/buried), technique of excavation (trowel/screwdriver), soil processing method (flotation/water-sieving), combustion effects on grains (popped seeds, grains with protrusions, deformation), state of preservation of the grains, embryo adherence, degree of fragmentation of the record.

**The experiment.** A previously described assemblage of cereals and legumes will be charred under controlled conditions. Thus, the composition of the assemblage will be known, as well as the heat exposure conditions. 5 different units of analysis are needed in order to have all the possible combinations among type of context, technique of excavation and soil processing method. Thus, 5 pits will be dug (see points 4 and 5). This allows us to control the horizontal and vertical distribution of the artifacts by isolating them in different units. pH of the soil will be measured.

## The plan

1. Initial description of the assemblage
2. Charring
3. Description of the assemblage after charring
4. Pit digging and deposition of the grains
5. Excavation
6. Soil processing
7. Final description
8. Conclusions

## 1. Initial description of the assemblage

6618 remains were chosen. c.190 ml of remains from the last stage of processing of naked wheat (barley intrusions).

They were collected during the "Festa del segar i del batre" (Harvesting and Threshing fair) from La Fuliola (Lleida). The whole threshing, winnowing and sieving process they had undergone was registered (unpublished). 100% of the remains were intact and grains still had the embryo. 4 grains were fragmented. 9 grains had been cracked during threshing and 2 had been peeled/cut.

c. 1500 seeds of lentils were also added.



## 2. Charring

The remains were put in two boxes of aluminium between two layers of sand to create an anoxic environment. One box contained 5111 remains which were destined to be buried in 4 pits, while the other one contained 1507 remains that were to be exposed to open-air conditions. They were charred in a muffle (Select-Horn J.P. Selecta) from the Anorganic Chemistry and Chemical Analysis Laboratory of the University of Lleida. The remains were heated for 40 minutes at 250°C (after 1 hour and 20 minutes of slowly increasing the temperature).

## 3. Description of the assemblage after charring

Charring has had differential effects on both assemblages. The remains from the smaller assemblage were completely charred but the ones from the bigger assemblage presented different degrees of carbonization. At least 12% of the remains weren't completely carbonized. Lentil seeds have swelled during charring. 100% have broken the testa as a result of this swelling in the smaller assemblage but less than 70% in the bigger assemblage. All the barley grains from the smaller assemblage showed severe distortions (see pictures below). Only some grains of barley from the bigger assemblage were not completely charred or not popped. Aggregates of grains are present in both assemblages.

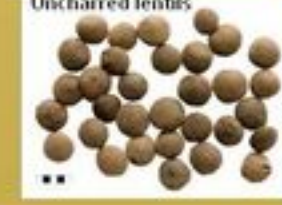
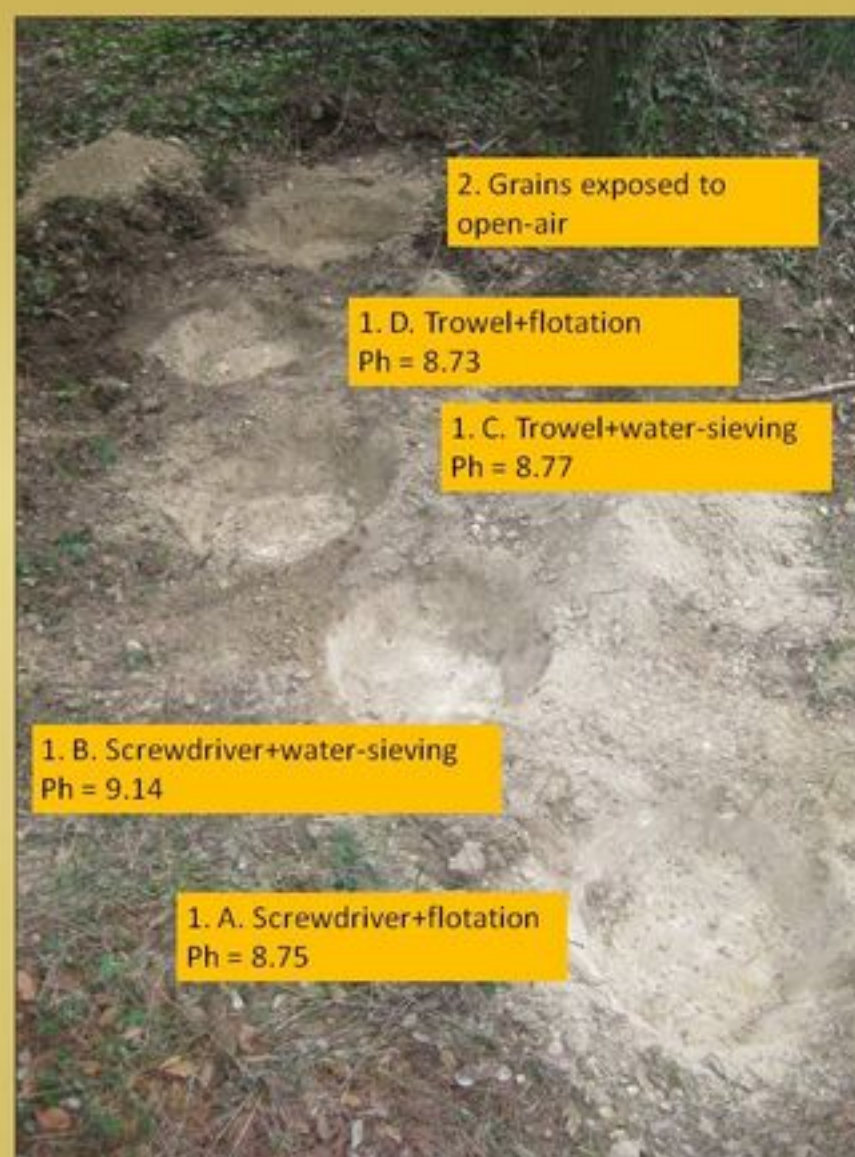
14,65% of the cereal grains of the bigger assemblage are popped or show protrusions, while 17,73% show these features in the smaller assemblage.

Grains that had suffered fragmentation or cracking during threshing were clearly detected. Characteristic bulging sections have appeared on the pre-charring fragments of caryopsis. Cracked grains have also adopted a similar type of distortion (see picture below). Pre-charring fragmentation on lentils is more difficult to detect.

## 4. Pit digging and deposition of the grains

5 pits have been dug. 1.a to 1.d. will contain ¼ of the bigger assemblage and they will be covered with soil. The fifth pit (2) will contain the smaller assemblage, which will be left exposed to open-air conditions. The assemblages were left for 30 days

## 5. Excavation



## 6. Soil processing

The soil samples were measured and soaked with water before processing. Flotation was undertaken with a 1 mm mesh size inside and outside the machine. Water-sieving was also done with a 1 mm mesh size sieve.

## 7. Final description

Formation processes have had very little effect during the period of exposition, recovery and processing of the remains. Covering the grains with soil actually protected them and the soil was still very loose when excavation took place, which resulted in a very low fragmentation rate. Fragments only appeared in the samples treated by water-sieving (3 in total). Pit nr.2 had some new soil naturally deposited, which resulted in the formation of concretions that affected the grains. Also some grains were involuntarily displaced by snails (see picture next to the text).



## 8. Conclusions

Some interesting conclusions can be drawn from this first experiment:

- The volume of grains is an important variable when exposing an assemblage to heat. Uncharred grains can appear together with grains with protrusions. Thus, the fact that we have these type of remains in the archaeological record doesn't ensure that the whole assemblage was charred and preserved.
  - Lentils have high possibilities of losing their testa due to charring since the swelling of the cotyledons fragments it.
  - Barley grains inside their glumes can completely distort at low temperatures.
  - Short-term exposition of grains to open-air can leave no traces but the formation of soil concretions.
  - Water-sieving is probably more aggressive to grains than flotation.
  - Cracked grains are identifiable in archaeobotanical samples, as well as, pre-charring fragments of caryopsis.
- For the improvement of future experiments several observations must be highlighted:
- The carbonization of the grains should try to imitate possible real archaeological cases. Thus, high heating rates should also be applied in future experiments.
  - Covering of the grains with soil for a short period doesn't generate a typical archaeological consolidated layer. Thus, possible fragmentation is minimized and the whole experiment fails. This period should be increased and precise types of soils should be targeted and compared.
  - The period of exposition of the grains to the formation processes must increase. After 1 month, no consequences of formation processes are observable.

## References

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Maybe they didn't help that much in the end...

AHA!