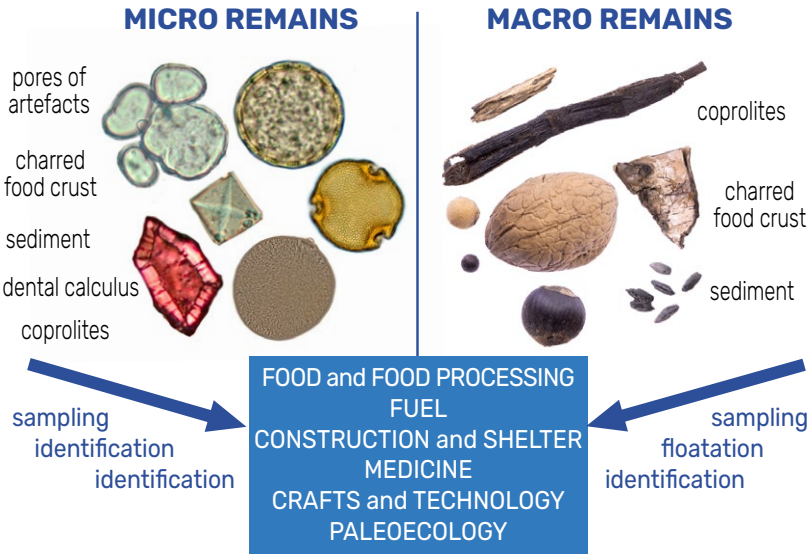
PLANT REMAINS

Archaeological plant remains are divided into macroscopic (mainly seeds, but also wood pieces, leaves, stems, roots) and microscopic remains (pollen, phytoliths, starch grains). The study of archaeological plant remains helps to clarify the relationships between past societies and their immediate environment, such as reconstructing past vegetation, investigating former land use and agricultural practices, and understanding the use of plants for food, construction, crafts, fuel, animal husbandry, and medicine.

Plant remains can be extracted from **soil samples** (macro- and microremains), **archaeological artefacts** (e.g. pottery shards, especially the charred layer, pores of stone artifacts), **dental calculus**, or **coprolites** (microremains, and macroremains from coprolites). The study of plant remains involves identifying the taxon (genus, species) for both micro- and macroremains. At the biomolecular level, stable isotopes and DNA of plants can be studied.



Archaeological artefacts and ecofacts, which can be analysed to identify both macroscopic and microscopic plant remains.

IMPORTANT OBSERVATIONS FOR FIELDWORK

Collecting Soil Samples

- Prefer collecting plant remains as soil samples rather than picking them individually from the soil.
- Ideally, combine a complete sampling strategy (from each layer and grid) with a targeted sampling strategy (more samples from interesting contexts). Consult an archaeobotanist if necessary.
- The volume of macroremains samples should be 10–60 litres. For smaller specific contexts, such as pelvic cavities of skeletons, post holes, ovens, collect all the soil.
- **Precisely mark the context of the sample**: site name, coordinates, depth, stratigraphic context (layer, pit, excavation, etc.), sample type (macro, pollen, phytolith, starch, all together), observations on layer mixing, sample quantity, name and contact of the sampler, date.
- When collecting microremains (pollen, phytoliths) from the soil, combine horizontal and vertical sampling (from each layer in the profile). Samples should touch each other.
- Ideally, take control samples 50, 100, and/or 200 metres away from the settlement.
- Microremains can also be separated later in the lab from macroremains samples. Inform the archaeobotanist if you plan to do this.
- For microremains samples, 200 ml is needed if you want to identify pollen, phytoliths, and starch.

Important observations when handling soil samples.

	MACRO REMAINS	MICRO REMAINS		
		POLLEN	PHYTOLITHS	STARCH
sample quantity	10–60 l (1–5 l)	60 ml[1]	60 ml	60 ml
do not toss bags, be careful	yes	not important	not important	not important
clean tools with 70% alcohol or 10% bleach solution	recommended if taking microremains sample from the same sample	yes	yes	yes
sample from freshly cleaned surface	yes	yes	yes	yes
nitrile gloves and sterile bags	recommended if taking microremains sample later from the same sample	yes	recommended	yes (very important)
dry samples before storage	yes	yes	yes	yes
for long-term storage, refrigerate (0–6°C)	recommended	yes	not important	yes

1 200 ml if taking one sample for all microremains

Artefacts

- Do not touch pottery shards with a charred layer or other items (e.g. grinding stones, scrapers) from which you intend to take a plant microremains sample.
- Package the item to be sampled separately, use nitrile gloves or wash your hands, and do not use hand cream.
- Do not eat while packaging.
- If possible, take a control sample from the soil beneath and around the item (5–10 cm away from the item).

When planning molecular (DNA, isotopes) analyses of plant remains

- Use gloves and sterile tools (sterile trowel, tweezers).
- You can sterilize tools with 70% alcohol or a 10% bleach solution (sodium hypochlorite, NaClO). Proceed as follows: soak the tool in the bleach solution for 10 minutes, rinse with clean water, and let it air-dry.
- Do not wash, dry, or touch items/plant remains to avoid contamination from the surrounding environment.
- Store in a sterile bag or vial, in a dry place without large temperature fluctuations.

RESEARCH QUESTION	METHOD	MATERIAL ANALYSED	NOTES	SAMPLE QUANTITY
age of plant remains	AMS	burnt and unburnt macroscopic remains collected from various environments (waterlogged, dry)	when dating aquatic plants, consider the reservoir effect, which can result in artificially older dates	4–10 mg
taxonomic identification of plant remains, pathogens, plant domestication	DNA	unburnt, partially burnt macroscopic remains collected from various environments (waterlogged, dry)	waterlogged plant remains should be freeze-dried for optimum DNA preservation	one seed, approximately 200 mg of plant material from larger tissues (e.g. branches)
use of natural fertilizers	N and S isotopes	burnt macroscopic remains	burning can alter the carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}5N$) values of seeds, and the extent of this change is related to the cereal species, heating temperature, and time	2 mg
changes in water regime (intentional or not)	C isotopes	burnt macroscopic remains		2 mg
origin/provenance	Sr isotopes	unburnt macroscopic remains collected from various environments (waterlogged, dry)	a soil sample (1–2 g) should also be taken	0.5–1 g

IN COLLECTIONS

Storage of soil samples

- Soil samples should be processed (flotation, sieving, separation of plant remains) as soon as possible after collection.
- **Unprocessed soil samples should be stored stably** – dry them covered to prevent contamination and store them dry (regular soil) or keep them in the refrigerator (waterlogged soil). It is important to avoid mould growth.
- Separated plant remains should be stored in clean tubes/jars/containers in a dry and preferably cool place, without large fluctuations in temperature and humidity. Store them dried (regular soil) or in 70% ethanol (waterlogged soil).

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See also: www.archemy.ee

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