Macrofossil analysis within the project Åker gård 7/201, Del C, Hamar kommune, Hedmark ID103215

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Introduction
A number of 25 macrofossil samples from the excavation of the Iron Age site at Åker gård were analysed at the Environmental Archaeology Laboratory (MAL) at Umeå University. According to the found artefacts the site is dated from 25 to 770 AD. The samples derive mainly from postholes but also from some other features such as burnt layers, refuse pit, ash layer. Two samples (A42230 and A41473) come from ovens/kilns/hearths. Secondary burned ceramics and a secondary-deposited ceramics about a meter away from oven/kiln A42230 were found. These finds were considered by the excavators as indicators that oven/kiln A42230 may have been used for ceramic production. The found clay fragments give a key of possible clay overlay/cover. Oven/hearth A41473 differs. There is visible burnt layer in the bottom of the oven-hearth and no traces from a clay overlay/cover. The archaeological artefacts consist of lots of small organic slag fragments. The analysis of the archaeobotanical remains will try to help for further and more detailed interpretation of the different archaeological features: ovens, ash layers and culture layers.

Materials and Methods
The material has been collected and floated by the staff at Oslo University/ Cultural History Museum. Sample size before floatation varied between 1.5 – 4.2 litre. The floated material was sorted and identified under stereomicroscope. Charred/carbonised plant remains were extracted from samples and the amount of woody charcoal estimated as relative proportion of the floated sample volume as follows: x = 25%, xx = 50%, xxx = 75%, xxxx = 100% of floated sample volume. The identification of plant species was done using reference literature for cereals (Jacomet, 2006) and plant seeds (Cappers, Bekker, & Jans, 2006) and the laboratory reference collection. Norwegian names of the genera and species are after the Norwegian and Swedish Flora (Lid & Lid 2005) and the Virtual Flora (Anderberg & Anderberg, u.d.).
Plant macrofossil identifications are referred to as “taxa” (“taxon” in the singular). When preservation is good, cereal identification can be performed at species level e.g. Hordeum vulgare (barley/bygg) and even subspecies level, such as Hordeum vulgare var. vulgare (hulled barley/agnekledd bygg). In cases of bad preservation, cereals are defined simply as Cerealia (indet). Half cereal grains or small pieces and fragments are referred to as Cerealia fragments. When a macrofossil looks like a particular species but lacks the specific species characters necessary for a 100% reliable identification, it is referred to as “cf. taxa” (cf. Triticum, means “looks like” wheat). This system has been applied to all of the botanical material. Plant names are given in the text as "Scientific/Linnean name (English/Norwegian)” and provided in Table 1.

The macrofossil analysis of the site was performed by Sofi Östman and Ivanka Hristova.

Results

A total of 25 plant macrofossil samples from different features within the Iron Age site Åker gård were analysed. The number of found plant remains per sample varies considerably from 0 to more than 500. The total number of the identified seed/fruit remains were 596. All floated samples consist of considerable amount of charred wood fragments, and in five samples (Arkeologisk objekt ID: 42230, 41622, 40431, 41740, 41031) charcoals are the only preserved botanical remains. Seeds and other botanical material are not included in this volume and are presented in Table 1. If we exclude those five samples, the average concentration varies between 0,3 and 7,6 items per litre sediment. Two exceptions are observed: sample A40175 with 17 items per litre sediment, which comes from a posthole (A40175); and sample A41473 (oven/hearth) with extremely high density of botanical finds – 203 items per litre sediment.

Almost all samples contain cereals or at least cereal fragments. Due to the bad preservation of the plant material, many of the cereal grains were determined as Cerealia or Cerealia fragments. It is important to mention that the number of found cereal fragments do not correspond to the number of cereal grains as more than one fragment may come from one and the same grain. The only identified cereal crop from the studied samples is Hordeum vulgare (barley/bygg), and prevailing is the hulled subspecies Hordeum vulgare var. vulgare (hulled barley/agnekledd bygg). In some cases, it was impossible to determine if the barley grains belong to Hordeum vulgare var. vulgare (hulled barley/agnekledd bygg) or Hordeum vulgare var. nudum (naked barley/naken bygg) subspecies. To avoid misinterpretation of the plant remains those barley grains were determined to species level as Hordeum vulgare (barley/bygg). Several Avena sp. (oat/havre) grains were identified. As a very good conservation is required to distinguish the cultivated oat from the wild form and as we have found just single items, they were classified into the group of Weeds/Ruderals.

For further interpretation, the samples have been divided in groups according to the provided by the excavators’ information (see Fig. 1).

Sample from a Refuse pit

A sample from a refuse pit (A40095) produced only a single cereal grain of Hordeum vulgare (barley/bygg), which is insufficient material for interpretation. The floated sample contains about 75% of charcoal that confirms presence of burned layer.

Ash layer

One sample from ash layer (A40305) was analysed. Only cereal crops were found. Some of them were identified as Hordeum vulgare var. vulgare (hulled barley/agnekledd bygg) but the rest were poorly preserved and fragmented and further identification than Cerealia was not possible.
Samples from and around the oven/kiln 42230

The sample from oven/kiln A42230 produced no plant macrofossils, although about 100% of the sample is represented of charcoals. Several other samples from postholes in the close proximity of the oven/kiln were provided for analyses, too. The amount of charcoals in all of them is quite high. Samples A41622 and A41031 do not contain any preserved plant macrofossils remains. The only sample which contains several items, most of them fragmented cereals is 42232. The lack and low number of seed/fruit remains in the samples could be a hint that the area was used for different than processing of cereals, storage, cooking, etc. purposes, which on the other hand could be a confirmation of the excavators’ hypothesis that the oven/kiln was most probably used for ceramic production.

Samples from house V (the area around oven/hearth 41473)

This area is the richest regarding the preserved archaeobotanical remains. A sample from an oven/hearth 41473 and six postholes were provided for analyses. The preservation of the plant remains in the samples is poor and many of the preserved seeds/fruit are fragmented. The average amount of the charcoals in the floated samples is between 50% and 100%.

The sample retrieved from oven 41473 is extremely rich in macrofossils containing almost half of all botanical remains found in the provided samples from the site. The density of the plant macro remains is 203 items per litre sediment. The concentration in several other samples from the same area is also comparatively high between 6,5 and 7,6 items per litre sediment (40165, 41440, 40417). One of the samples A41740 do not provide any other botanical remains than charcoals.

The cereal crops are presented by Hordeum vulgare var. vulgare (hulled barley/agnekledd bygg). One part of the barley grains are badly preserved and cannot be determined to subspecies level. The samples also contains many whole and fragmented indeterminate cereal grains. Weed and ruderal species are dominant by Chenopodium album (Fat-hen/ meldstokk) and Spergula arvensis (Corn spurrey/ Linbendel). Also presented but in smaller numbers are Thlaspi arvense (Field Penny-cress/ Pengeurt), Fallopia convolvulus (Black-bindweed/ Vindeslierekne) and Galium cf. spurium (False cleavers/ Småklengjemaure). Chenopodium album prefers nitrophilous soils, while species like Spergula arvensis and Fallopia convolvulus reflect coarse-grained soils.

Impressive is the great amount of Silene dioica (Red Campion/ Rød jonsokblom) in the sample from the oven/hearth. It is a ruderal and prefers damp and non-acid soils.

The samples also produce some other wetland/meadow species like Carex (sedge/star), Schoenoplectus sp., Ranunculus sp. (Buttercup family/ Soleie) and Luzula multiflora (Heath Wood-rush/ Engfrytle).

Species belonging to Poaceae (Grass family/ Gräs familjen) and Fabaceae (Bean family), as well as Viola sp. (Pansy/ Fiol) are also common for that sample. Many of the smaller seeds from non-cultivated species are fragmented or just the inner part is preserved.

Two finds of Rubus idaeus (Raspberry/ Bringebær) are identified, which could be a hint that the collecting plants were part of the diet of the population.

All samples from house V come from the area around the oven/hearth, which makes it difficult to study and interpret the results in a broader perspective, such as functional division within the house.

The extremely rich assemblage of botanical remains from the oven/hearth sample paste a lot of questions concerning its interpretation. The presence of both cultivated and wild growing species (weeds/ ruderals/meadow/ pasture/ wetlands) with prevailing numbers of the wild growing species could be a hint that the preserved remains represent refuse from the crop processing used as fuel. It could also represent remains from other activities in the house for
example fodder remains or dung from the barn used as fuel. If the fireplace was used for food preparation, it is quite possible small amounts of cereal crops to be charred and preserved within the oven/hearth.

Samples from house VI
Two samples from house VI have been analysed (40326 and 40175). The concentration of the botanical remains in sample 40175 is quite high - 17 items per litre sediment. The preserved cereal crops comprise only *Hordeum vulgare var. vulgare* (hulled barley/agnekledd bygg) and unidentifiable cereal fragments. Preserved porous matter stacked to some of the cereal grains is available in sample 40326 (Fig. 2a). A seed of *Linum usitatissimum* (linseed/lin) was identified in one of the porous fragments (Fig. 2b). In others, seed pericarp and traces of stems are visible (Fig. 2c). Identification and interpretation of such remains is very difficult. They most probably come from dung that was collected in the close proximity, but further analyses are needed for more precise interpretation. As we have just two samples from house VI it is impossible to make any further interpretations concerning space and functional division of the house.

The most numerous weed in the two samples is *Chenopodium album* (fat-hen/meldstokk), but also species like *Galium cf. spurium* (False cleavers/Småklenjemaure), *Fallopia convolvulus* (Black-bindweed/Vindselirekne) were found. The predominance of *Chenopodium album* (Fat-hen/Fat-hen) points to intensive manuring of the fields (Viklund, 1998). In order to receive more information if manuring was used it is always good to combine archaeobotanical results with soil chemistry.

Seeds of meadow/pasture plants like *Melilotus* sp., *Viola* sp. (Pansy/Fiol) were also presented.

Samples from burned house area
Six samples from burned house area were provided for analyses, all from postholes. The samples are almost entirely charred as the floated material contains more than 75% of charcoals. The concentration of seed/fruit remains is very low. It rarely exceeds 1 item per litre sediment. The composition of the finds is quite similar to what have been discussed above. The identified cereal crop is *Hordeum vulgare* (barley/bygg), mostly *Hordeum vulgare var. vulgare* (hulled barley/agnekledd bygg). The found weeds and ruderals are *Chenopodium album* (fat-hen/meldstokk), *Galium* sp. (Maureslekta) and *Rumex* sp. (Sorrel/Syreslekta).

Samples from postholes under cultural layer
Three samples from posthole under cultural layer were analysed. The charring of the floated samples varies from about half to completely charred. The concentration of the botanical remains is low. The highest concentration is observed in the sample that is completely charred. The identified species are *Hordeum vulgare* (barley/bygg), *Chenopodium album* (fat-hen/meldstokk), *Galium cf. spurium* (False cleavers/Småklenjemaure) and a single grain of *Avena* sp. (oat/havre).

Sample from a cultural layer A70926.
A sample from a cultural layer A70926 was analysed. The charcoals in the floated sample are about ¼ of it, and the only macrofossil find is a fragment of a cereal crop.

**Conclusions**
Most of the studied samples, totally 20, come from postholes. The samples are not very rich in plant remains, and five of them (42230, 41622, 41031, A41740, A41031) do not contain any preserved plant macrofossils remains. Although the bad preservation of the botanical remains the found spectra give an overview of the cultivated and used plants in the study area.
The only identified to species level cereal crop is *Hordeum vulgare* (barley/bygg), mostly *Hordeum vulgare var. vulgare* (hulled barley/agnekledd bygg). Many of the cereal grains have lost their surface and/or are broken losing their identifiable characteristics. Weeds are mainly represented by the common species for the region like *Chenopodium album* (fat-hen/meldstokk), *Fallopia convolvulus* (Black-bindweed/Vindeslirekne) and *Galium cf. spurium* (False cleavers/Småklengjemaure). Some seeds of *Melilotus* sp., *Viola* sp. and the Poaceae (grass) and Fabaceae (bean) family were also produced.

The weeds/ruderal plants found are mostly nutrient requiring/nitrophilous, and give some indications that permanent field system with manuring was used (Viklund, 1998). They are also typical for spring-sown crops, which well correspond to barley cultivation. The presence of different size species from low-growing plants like *Viola* sp. (Pansy/Fiol), *Thlaspi arvense* (Field Penny-cress/Pengeurt) to high-growing ones such as *Rumex* sp. (Sorrel/Syreslekta), *Chenopodium album* (Fat-hen/Fat-hen), *Galium* sp. allows as to infer that the harvest was performed close to the ground.

Some of wild growing species may have been collected purposefully for human consumption or animal fodder.

**References**


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**Table 1. Macrofossil results**
Fig. 1. Map of the excavated area indicating the position of the macrofossil samples

Fig. 2. Fragments of porous matter preserved in sample 40326, House VI.
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