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# Charred plant remains from a 10th millennium B.P. kitchen at Jerf el Ahmar (Syria)

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**Abstract.** The Pre-pottery Neolithic A (PPNA) site of Jerf el Ahmar, Syria, dated to the 10th millennium uncal B.P., has produced over 657 flotation samples which are now under study. The results described in this article were obtained from the analysis of 32 samples of charred plant remains taken from a room of 2.5 x 3 m, which had been destroyed by fire. The room contained three saddle querns, two flat polished stone plates (each of 60 cm in diameter), one hearth, and three limestone "basins". These objects were *in situ* and the room appeared to represent a food preparation area (kitchen). On one of the querns two charred seed cakes were found. The finely ground seeds have been identified as *Brassica/Sinapis,* a rare taxon for this period. The major taxa, which are morphologically wild, have distinct spatial distributions, which provide evidence for plant processing activities. *Hordeum spontaneum* and *Triticum/Secale* were processed separately. The association of *H. spontaneum* with stone basins suggests soaking of this grain.

**Key words:** Early Neolithic – Northern Syria – Food preparation – Seed cake – Wild cereals

## Introduction

Jerf el Ahmar is situated on the east bank of the river Euphrates in northern Syria (Fig. 1). It was excavated as part of a rescue project between 1995 and 2000 by Danielle Stordeur and Bassam Jammous and is now covered by the waters of the Tishrine dam (Stordeur et al. 2000, Stordeur 2000). Present-day climatic conditions with an annual average rainfall of 250 mm, which is highly variable from year to year, permit dry farming of barley. The vegetation of the area is that of a degraded moist steppe. Wild barley may be found growing in the area but not einkorn, the climate being too dry (Willcox 1996).

The site covers an area of about one hectare. Sixty buildings have been excavated. These included a variety of architectural types with round houses in the earliest phase and the development of oval and rectangular houses in later phases. Four large pit buildings were also found

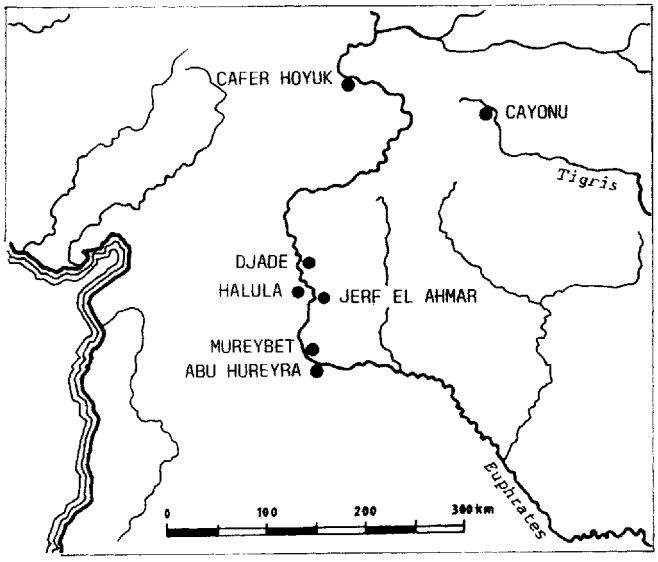


**Fig. 1.** Site location map, giving other early agriculture sites in the region which have undergone extensive archaeobotanical analyses

and these are interpreted as communal buildings. Eleven radiocarbon dates indicate that the site was occupied between 9800 and 9100 uncal B.P. (9100 and 8300 cal B.C.) and that the levels reported on here are dated to approximately 9600 uncal B.P. (9000 cal B.C.). Over 100 of the 657 flotation samples obtained from the site have been analysed, indicating that *Hordeum* (barley) is the dominant cereal both in terms of presence and in absolute numbers of grains. *Triticum boeoticum/urartu/Secale* (two-grained wild einkorn and/or rye) is present, but at low frequencies (Willcox and Fornite 1999). *Lens orientalis* (wild lentil) is common. Other pulses such as *Vicia ervilia* (bitter vetch) and *Vicia/Pisum* (pea) are less frequent. All cereal spikelets show wild-type abscission scars and there is no evidence for morphological domestication. Faunal remains indicate that there was no herding. Equids and gazelles were the most commonly hunted animals (Helmer et al. 1998; Peters et al. 1999). A weed assemblage consisting of *Adonis, Astragalus, Bromus, Centaurea, Chrozophora, Coronilla, Erodium, Fumaria, Galium, Glaucium,*

**Fig. 2.** Photo of room N° 2 at Jerf el Ahmar taken from the east looking west. For scale and details see **Fig. 3**

*Hordeum murinum* type, *Lathyrus*, *Lithospermum*, *Malva*, *Papaver*, *Polygonum*, *Reseda*, *Silene*, *Thymelaea*, and *Vicia* strongly suggests that pulses and/or cereals were cultivated. Fragments of *Pistacia* and *Amygdalus* nutshells were common among the charred remains from Jerf el Ahmar and these two taxa have also been identified in the wood charcoal, however they do not occur in the local vegetation today. In this article, results are restricted to a unique find from a room which was destroyed by fire. Preliminary archaeobotanical results of the site are given in Willcox (1996) and Willcox and Fornite (1999).

The majority of flotation samples from Jerf el Ahmar taken between 1995 and 2000 came from contexts that represented accumulations of domestic waste from outside the buildings, where plant remains from different activities had become mixed in secondary reworked deposits. These samples represent multiple burning events. The results described here from building N°10, room N°2, which was destroyed by fire, provided a rare opportunity to sample undisturbed deposits representing a single event dated to the second half of the 10th millennium uncal B.P. (Fig. 2). The walls were preserved to a height of 80 cm and the pisé roof structure had collapsed into the room, providing conditions for charring. Excavation unearthed an exceptional number of undisturbed archaeological objects consisting of three saddle querns, two flat polished stone plates (60 cm in diameter), one hearth, three limestone "basins", one small limestone bowl, and several pounding stones. The room appears to represent a food preparation area or kitchen, there being very little space for other activities (Fig. 2).

## Methods

Once roof and wall debris had been removed, systematic sampling based on a one metre grid was carried out in order to test for the spatial distribution of different taxa. 32 flotation samples were taken from a layer approximately 15 cm thick, which corresponded as far as possible to the floor surface. A sieve mesh of 0.5 mm was used for the flotation sieve and 2.5 mm for the wet sieve. In order to obtain information on the spatial distribution of each taxon, the concentration of seeds per litre of sediment was calculated. For the barley, which was highly fragmented and the fragments of seed cake, the volume in ml was used as a measure rather than counts.

**Table 1.** Results of identification by square metre from room N°2, building N° 10, at Jerf el Ahmar. Barley and seed cake are given by volume in ml

| Square | D80 | D81 | E80 | E79 | E81 | F82 | F81 | F80 | F79 | G80 | G81 | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol. sed litres | 123 | 50 | 125 | 35 | 130 | 95 | 145 | 95 | 10 | 70 | 35 | 913 |
| Vol. flot in **ml** | 20 | 40 | 21 | 7 | 60 | 31 | 52 | 31 | 0 | 31 | 30 | 323 |
| *Triticum/Secale* | - | - | 2 | - | 15 | 2 | 3 | - | - | 1 | - | 23 |
| *Hordeum* rachis | 12 | 4 | - | - | 44 | 40 | 62 | - | - | - | 19 | 181 |
| *H. grain* in **ml** | **0.1** | **0.4** | **1.5** | **0.9** | **1.5** | **1.2** | **3** | **2.9** | - | **1.4** | **3** | **15.9 ml** |
| *H. murinum* type | - | - | 1 | - | - | 2 | - | - | - | - | - | 3 |
| *Vicia ervilia* | - | - | - | 1 | 1 | - | 1 | - | - | - | - | 3 |
| *Lens orientalis* | 4 | - | 3 | 3 | 11 | 25 | 11 | 10 | - | 10 | 21 | 98 |
| *Astragalus* type | 1 | - | 1 | 1 | 2 | 2 | - | 4 | - | - | 1 | 12 |
| *Malva* | - | - | - | - | - | - | - | 6 | - | - | 1 | 7 |
| Seed cake **ml** | **6** | **10** | **2** | - | **8** | - | **14** | - | - | - | - | **40 ml** |
| *Capparis* | - | - | - | - | - | - | 1 | 1 | - | - | | 2 |
| *Galium* | - | - | - | - | 1 | 1 | - | 3 | - | - | - | 5 |
| *Erodium* | - | - | - | - | - | - | - | 1 | - | - | - | 1 |
| Cruciferae | - | - | - | - | 4 | - | - | - | - | - | - | 4 |
| *Salsola* | - | - | - | - | - | - | 1 | - | - | - | - | 1 |
| *Amygdalus* frag | - | - | - | - | - | - | 1 | - | - | - | - | 1 |
| *Silene* | - | - | - | - | - | - | 1 | - | - | - | - | 1 |
| *Vicia* | - | - | 1 | - | - | 1 | 5 | - | - | 3 | - | 10 |
| Gramineae | - | - | 2 | - | - | - | 1 | - | - | - | - | 3 |
| *Polygonum* | - | - | - | - | 3 | - | - | - | - | - | - | 3 |
| *Pistacia* | - | - | - | - | - | - | - | 1 | - | - | - | 1 |

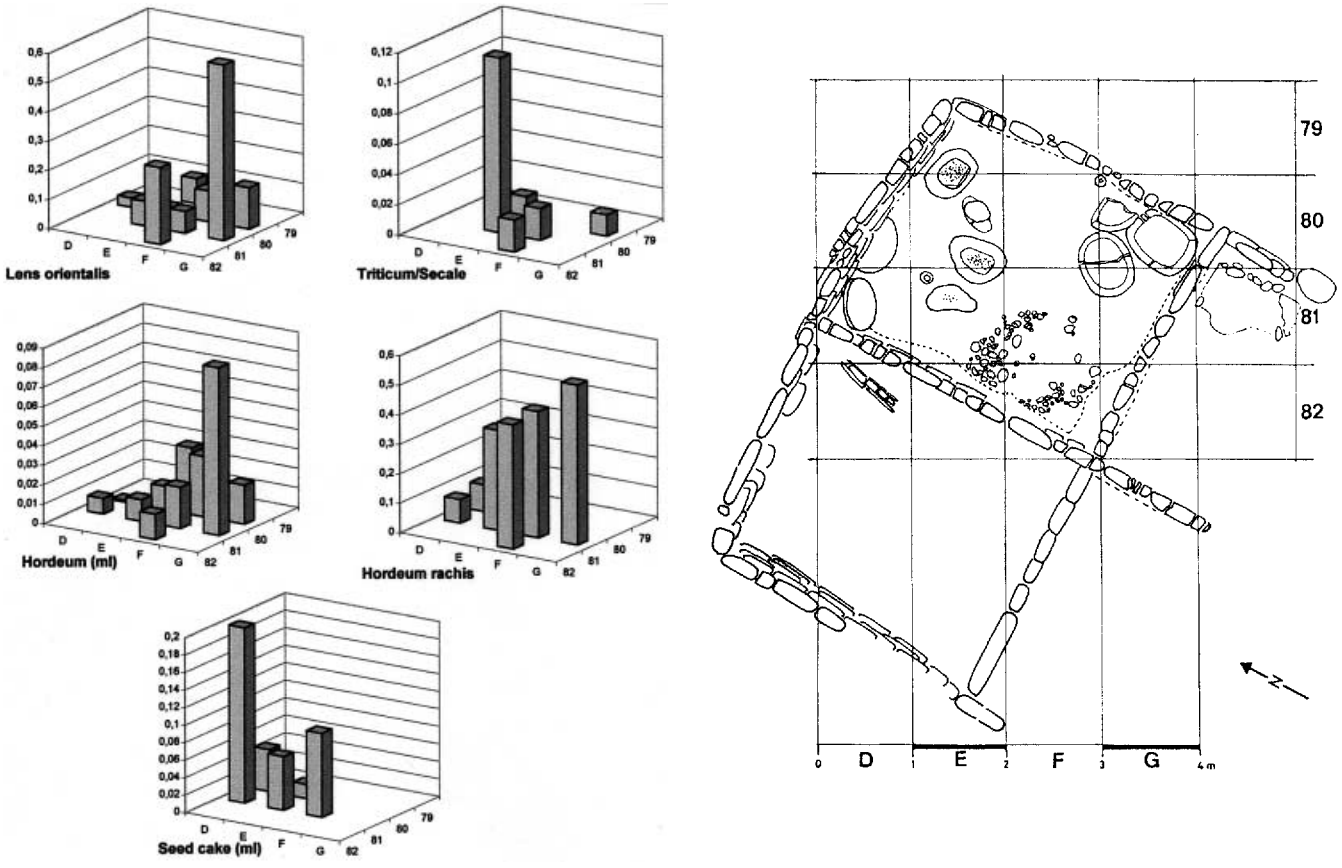


**Fig. 3.** Left; 3D histograms with vertical axis giving number of identifications for the five taxa per litre of sediment for each square metre grid of room 2. The letters and numbers in the horizontal axes refer to the grid. Right; plan of building ten showing the one metre grid and the position of different objects in relation to the grid. In the south-east corner three stone basins were found. Near to the west wall there was an area of hearths. In the north-west corner there were two flat polished stone plates (60 cm in diameter). Three saddle querns were found in the southern part of the room

## Results

32 samples representing 908 l of sediment were processed and sorted. Identification results are given in Table 1. The spatial distribution of the finds can be seen in Fig. 3 where concentrations of charred plant remains per litre of sediment sampled are given. The concentration of charred seeds and the number of taxa were low compared to samples from refuse contexts at Jerf el Ahmar. *Hordeum* (wild barley) dominates the assemblage; *Lens* (lentil) is common, while *Triticum boeoticum/urartu/Secale* (einkorn/rye) is less frequent. These relative proportions reflect those found in other areas of the site, which represent slow accumulations of domestic rubbish. Of particular interest here are the results obtained from the analysis of the spatial distribution of the different taxa in relation to the different objects found in the room (Fig. 3).

*Hordeum spontaneum*

Wild barley grains were found to be extremely fragmented. For this reason concentrations are based on volume rather than seed counts (given in ml, 1 ml = approx. 140 fragments and whole grains combined). Examination of the fractured surface indicated that, in some cases, the grains were broken prior to carbonisation. The broken surfaces showed clearly a puffed-out smooth surface formed during charring. In contrast, fractures which occurred after carbonisation showed a rough surface caused by alveoli which were formed by the expansion of gases during combustion (Fig. 4.6). Internodes of wild barley showing the characteristic brittle fracture were common. Whole grains also had a typical wild morphology Fig. 5.

*Triticum boeoticum/urartu/Secale*

The identification of these caryopses is problematic because of the similarity between wild rye and two-grained wild einkorn. However, using certain criteria developed by Hillman (2000), the caryopses appear to be closer to *Secale* than *Triticum*. Examples of this taxon can be seen in Willcox 1996, Fig. 3.3 and Hillman 2000, Figs. 12.5 and 12.6.

*Seed cake (Brassica/Sinapis sp.)*

Two charred seed cakes were found *in situ* on one of the saddle querns. This is the first time that remains of prepared food have been found from this period. Fragments of the same material were also recovered during flotation

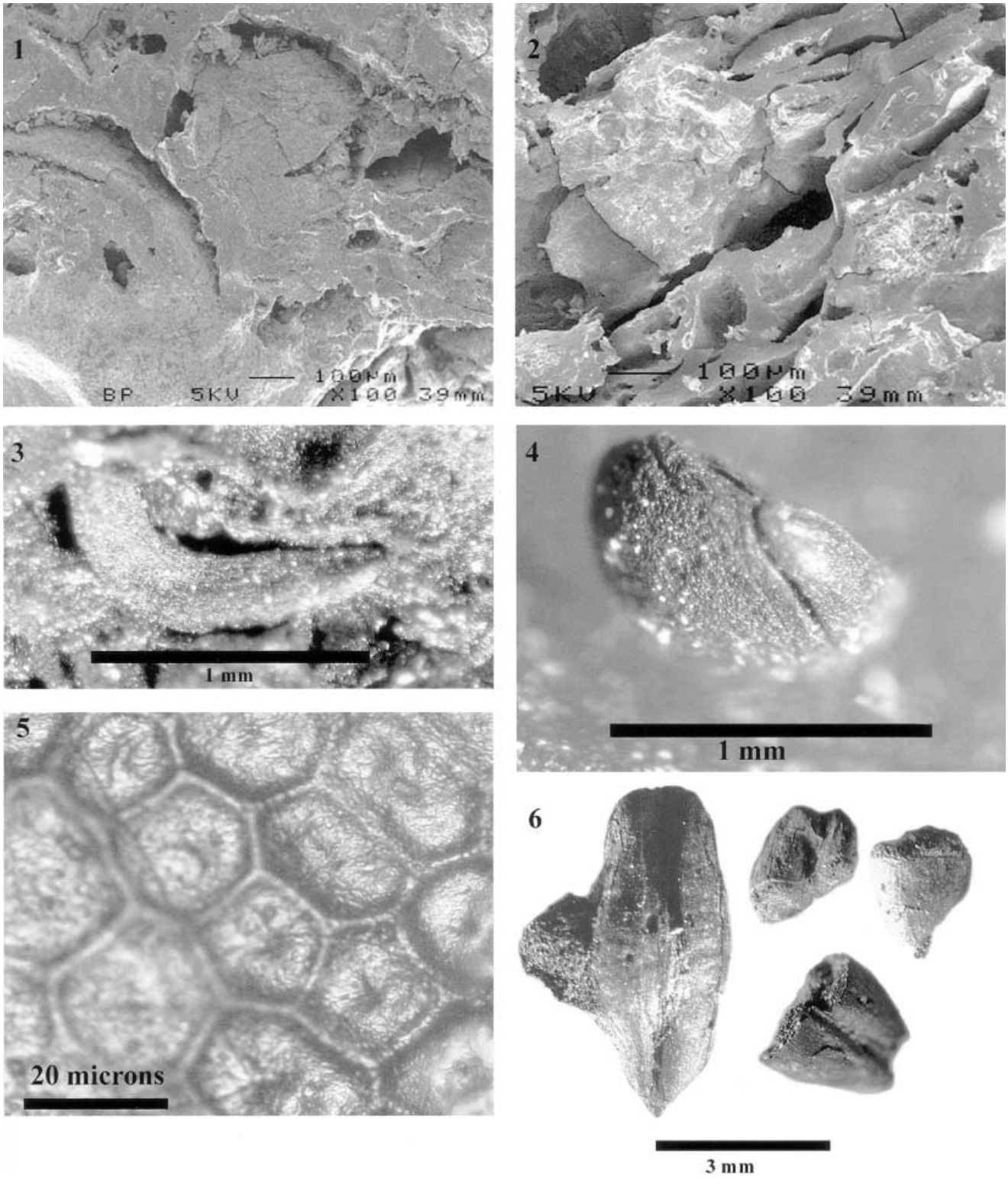


**Fig. 4.** **1** SEM of seed cake showing (middle left) a curved fragment of testa. **2** SEM of compacted fragments of testa, particularly clear in the top right. **3** Light microscope image of a radicle, several of which were observed in fresh fractures of the seed cake. **4** A partially broken Cruciferae seed recovered by flotation which has lost its testa showing the characteristic furrows of the cotyledon and the radicle (Berggren 1981). **5** Light microscope image of the reticulate pattern found on the testa fragments in the seed cake. **6** Charred wild barley grains. Left; complete grain showing puffing caused during charring. Top right and centre; grains broken prior to carbonisation showing puffing on broken surface. Below right; charred grain broken after burning showing rough fracture with alveoli

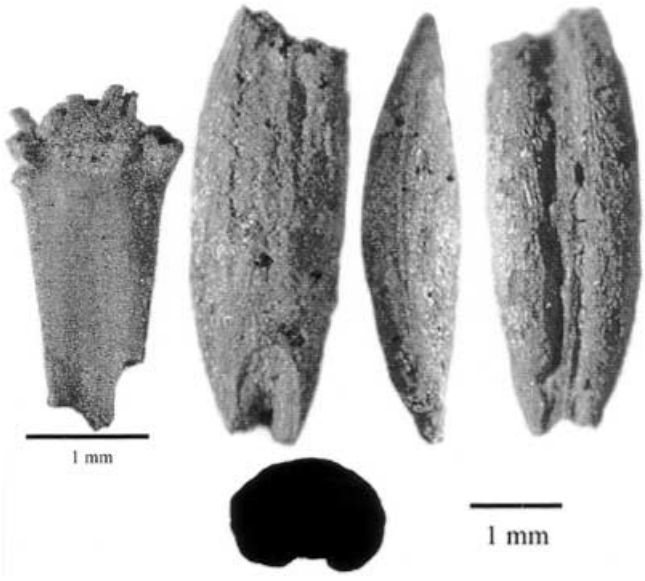


**Fig. 5.** Left; charred internode of *H. spontaneum* showing the abscission scar. Right; a typical charred grain of *H. spontaneum* with its wide ventral furrow and broad apex, somewhat broken in this case

and may represent the broken remains of other cakes (Fig. 3). The two complete seed cakes measured 8.5 x 3 x 3 cm and 7 x 3 x 2.5 cm respectively. The seed cakes and fragments were found to consist of fragments of testa which rarely exceeded 200 microns in their maximum length (Fig. 4. 1,2). They had a reticulate pattern suggestive of *Sinapis* and *Brassica* (Bernard 2000, Fig. 4.5). From a few large fragments it was possible to estimate that the seed cake was prepared from spherical seeds with diameter of approximately 1 mm which had been finely ground. There was no evidence, such as pericarp fragments, to indicate that cereals had been used in the seed cake. Several identification criteria strongly suggest that the seed cake was made up primarily of seed from *Brassica* or *Sinapis*. The reticulate pattern was one criterion but this showed much variability perhaps due to differing conditions of charring. Another was the circular hilum scar found on several fragments of testa which corresponded to those of *Brassica* and *Sinapis*. Within the seed cake, several radicles which had broken away from the embryo of the seeds during pounding were observed (Fig. 4.3). These were similar to those found when *Brassica nigra* and *Sinapis alba* were ground experimentally. Finally, four charred spherical Cruciferae seeds which lacked their testa, were found in a flotation sample from the same area as the seed cakes (Fig. 4.4). Examples of wild plants within this group which grow in Syria today include *Brassica elongata*, *B. deflexa*, *B. nigra*, *B. tournefortii*, *Sinapis alba*, *S. arvensis* and *S. aucheri*.

*Lens orientalis*

Lentils were the most common seed after barley grains. The size range corresponds with that of wild lentils. Another pulse, *Vicia ervilia*, was rare in the room and on the site in general and may not have been a crop. *Pistacia* and *Amygdalus* were only represented by one identification for each, although these taxa are common in other areas of the site. The other taxa appearing in Table 1 which occur at very low frequencies could be considered as weeds or ruderals.

**Discussion**

The charred remains from room N°2 are an exceptional find because they represent an instant in time and because they were found *in situ* in an undisturbed state. It appears that the conditions of charring were uniform throughout the room and the differing concentrations reflect the distribution of plant matter prior to charring. Concentrations of plant remains are low, which could be due to the fact that there may not have been a long period of accumulation. The querns indicate that milling and grinding were indoor activities. However, the low frequencies of chaff at least for *Triticum/Secale* suggest that threshing took place elsewhere. The relatively large proportion of barley internode fragments suggests that the barley crop was not well cleaned. Grains outnumber internode fragments by at least 10:1. Differential preservation may also have favoured grains over chaff. In either case, this suggests that the barley was poorly cleaned after threshing. Some of the barley was cracked prior to carbonisation (Fig. 4,6), which could have been the result of milling which appears to have occurred in the room. However, barley is most concentrated near the limestone basins, the biggest of which measured 65 x 57 x 32 cm. It is highly improbable that these objects were used for grain storage. One possible use shown by the proximity of barley concentrations is for soaking the grain. Lentils were concentrated in two areas, near the basins and near a hearth. No cracked lentils were observed.

Einkorn/rye has a different spatial distribution from barley. It is concentrated near one of the saddle querns, suggesting that these finds could represent spillage during grinding. This would also explain the occurrence of grain that had been broken prior to charring. The different locations of the two cereals suggests for the first time at Jerf el Ahmar that they were treated and therefore probably consumed separately.

The two seed cakes were found poised on one of the saddle querns while the fragments recovered by flotation were found to be concentrated between the saddle querns and the polished stone plates. This find appears to be a little used food, or one that is rarely preserved because there have been few finds of this taxon at Jerf el Ahmar, although seeds of this group were identified from Natufian levels at Abu Hureyra (Hillman 2000). The fineness of testa fragments shows the efficiency of the grinding technique. The compact nature of the seed cake leads one to ask if it was the residue left after oil extraction, but it could equally well have been consumed alone as a condiment or for flavouring. Seeds of the *Brassica/Sinapis* group have a mustard flavour of varying strength and a high oil content.

In conclusion, the room appears to have been used for grinding and perhaps soaking seed and grain. Very few animal bones were found in the room. There was no evidence for grain storage. However, some activities may

leave little or no trace and it is probable that certain plant materials were not preserved, for example soft tissue foods such as leaves and roots or objects in wood and basketry. Charred cereal grain may have originated from spillage during food preparation, but large items such as nuts and fruits are less likely to have been spilt. The hearth, which was very dispersed and perhaps disturbed, may have been used for cooking. The function of the impressive large flat plates with a polished surface still remains open to speculation.

*Note added in proof.*
Since the completion of this article an AMS date has been obtained from a fragment of seed cake (Lyon 1579, Gr 19340), with the following result 9620 ± 60 P.B. which gives a calibrated range of 9224 and 8753 B.C. cal. with the following dates starting with the most probable 8977, 8974, 8959, 9140, 8986 B.C. cal.

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