**Supplementary Information for**

The Evolution of plant harvesting at the dawn of agriculture: perspectives from sickle gloss texture analyses.

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METHODOLOGY

**Confocal microscopy and texture analysis**

Use-wear analysis, a method pioneered by S. Semenov1, is based on the comparison between use-wear traces (microscarring, rounding, striations and use-polish) on experimental and archaeological tools, in order to infer the function of the latter. This comparison is performed visually, using qualitative criteria. Among the different kinds of use-wear traces, use-polish is the most relevant one, as it allows the identification of the worked material. Plant (and cereal) cutting generates use-polish on the tool edge that -after some hours of use- can be observed macroscopically as a sheen that is called sickle gloss. Since the late 1980s, several essays have been carried out in order to obtain quantitative criteria for the characterization of use-polish 2 3 4 5. Nevertheless, it has been with the development of confocal microscopy and texture analysis that these trials have definitively moved forward 6 7. We have contributed to this line of research by working on the discrimination of use-polish (gloss) caused by cutting different types of plants 8 9.

A preliminary version of our methodological approach was previously described 8 9. In the improved version presented in this paper we have included one experiment of cutting grasses. Other methodological changes with respect to the previous versions are described below. The archaeological and experimental tools were cleaned with soapy water in an ultrasonic tank. The areas of gloss to be measured were chosen from among the zones where it is well developed. Between six and ten areas with harvesting gloss 650x500 µm in size were scanned on the experimental and archaeological tools with the Sensofar Plu Neox confocal microscope, using a 20X (0.45 NA) objective, with a spatial sampling of 0.83 mm, an optical resolution of 0.31 mm, a vertical resolution of 20 nm and a z-step interval of 1 mm. The 3D surfaces were sampled, processed and later measured with the Mountain 7 software, from Digital Surf. Several samples of 200x200 µm were taken from the 650x500 µm areas. In many cases three samples of 200x200 µm were taken from the 650x500 µm areas, summing around 20 samples per tool. The samples were chosen in the areas where microwear polish was homogenous and well developed and did not show irregularities caused by the natural surface of the flint. A leveling operator using the Least Squares (LS) Plane Method was employed to correct for the lack of horizontality of the 3D surface. To separate polish texture associated with the characteristics of the worked material from the irregularities of the flint surface, a spatial filtering was used, consisting of moving a small filtering matrix (called a kernel matrix) over the surface. The arithmetic mean operator consists of averaging each point with its 13x13 neighboring points. The microtexture that is going to be measured is calculated by subtracting the filtered surface from the source surface (Figure 1).

Several areal surface parameters defined in ISO 25178 were selected on the basis of their discriminant capacity for the five experimental categories taken into account in this study:

1) Amplitude parameters, a class of surface finish parameter characterizing the distribution of heights (Sa, the mean height of the surface; Sq, the square root mean height; Sz, the distance between the highest peak and the deepest valley; Sp, the maximum peak height and Sv, maximum valley depth area).

2) Spatial parameters, which quantify the lateral information present on the X and Y-axes of the surface based upon spectral analysis (Sal, expressing the content in wavelength of the surface; Str, which measures whether the surface is isotropic).

3) Hybrid parameters considering both the amplitude and the spacing (Sdq, the root mean-square value of the surface slope; Sfd, indicating the complexity of the surface using the fractal dimension theory).

4) Parameters measuring the micro-valley network, obtained after the vectorization of the surface, searching for all the furrows in a surface and measuring their mean depth (MDF) and mean density (MDenF).

Quadratic discriminant function analysis was used to build a predictive model for group membership, which is composed of discriminant functions based on quadratic combinations of predictor variables when these variables show different variance-covariance matrices. The classification rule of the predictive analysis is based on the Bayes’ theorem. This type of statistics is very sensitive to the presence of outliers, which can distort the final result of the classification. Because of this, for the experimental tools, the outliers for the eleven parameters used in the analyses were eliminated (that means 10% of the measured areas). For this, we eliminated the cases greater than three times the Interquartile Range.

**The experimental program** (Table 1)

The experiments harvesting wild cereals growing in natural stands were carried out in the Jebel el Arab, Southern Syria, in mid and late May 1995 and 1996. Stands of *Triticum* *boeticum* were harvested at a phase when most of the stems were just yellowing and the first grains had detached from the seed head, but before complete maturity. Sickles with wooden and antler handles were used over 11-13 h, with fine-grained flint inserts. In the same region, in 2009 and 2010, stands of *Triticum dicoccoides* and *Hordeum spontaneum* were harvested for over 4 h at the beginning of June, when the grain was already formed, but the plants were not completely ripe. We used a slightly curved sickle with a wooden handle, into which four fine-grained flint elements were inserted. *Hordeum spontaneum* (wild barley) was harvested using a single-bladed wooden sickle in 1993 in the Jordan Valley, Israel, for 2 h. In all these experiments, wild cereal stems were held in groups in the hand and were cut as close to the ground as possible, usually about 20 cm from it.

Cultivated wild cereals (*Triticum boeoticum thaoudar*) were experimentally sown and harvested in the grounds of the CNRS laboratory in the Institut de Préhistoire Orientale, Jalès, Ardèche, in a Mediterranean region of Southern France, between 1989 and 1994 10 11. Two-grained wild einkorn gathered in Eastern Turkey was imported, cultivated and harvested in controlled conditions. Broadcast sowing was carried out near the time of natural grain dispersal, between late June and August. Cultivated wild cereals were reaped between early June and mid-July, when the grain was near maturity and most was still attached to the stem. At this semi-ripe stage, in which the stems at the height of the cut were a mixture of yellow and green, the plants could be harvested without a significant loss of the grain.

Experiments harvesting domestic cereals included cutting spelt (*Triticum spelta*) during 7 h in Zureda (Asturias) in September 1994; einkorn (*Triticum monococcum*) in Seranon, Southeast France, for 4 1/2 h; and another tool used for harvesting bread wheat (*Triticum aestivum*), emmer wheat (*Triticum dicoccum*) and einkorn (*Triticum monococcum*) for 13 h in 1997 at Jalès. In all these experiments the stems were cut when they were ripe at a height of approximately 20 cm from the ground.

Reed-cutting experiments were carried out in Jalès (France), in shallow standing water, and when the stems were firm but not brittle. Grass-cutting experiments were carried out in Tunisia by P. Anderson 12. *Ampelodesmos mauritanica* is a fibrous grass related to the *Stipeae* tribe called *dis* or *diss* in Arabic. It is sickle-harvested and used as fodder and for making baskets, mats, ropes and whips and for roofing huts 13. Many plants other than cereals which were used by Neolithic groups (Sparta grass, Stipa or Juncus) are harvested by pulling them up, according to ethnographic observation 14 15. In total, twenty experiments were carried out for this study (Table 1).

**Classification of experimental tools**

The discriminant function analysis consistently groups the surfaces of use-wear polish resulting from cutting the three cereal types (domestic, wild cultivated and wild in natural stands), reeds and grass. Significant mean differences (Wilks' Lambda) were observed for all the predictors mentioned in the previous section and for discriminant functions. While the log determinants were quite similar, Box's M indicated that the assumption of equality of covariance matrices was violated, so a quadratic discriminant analysis was chosen. The Eigenvalue values show that Function 1 explains 47.7% of the variance, Function 2, 33.1%, Function 3, 13.2% and Function 4, 6%. The structure matrix showed main within-group correlation between variables Sa, Sq, MdF, Sdq, MDenF and Str with the first function, Sal and Sfd with the third and Sz, Sv and Sp with the fourth one. The classification table shows 73% correct classification of the five groups of plant use-polish (Table 2).

The classification of the 3D surface of each experimental tool offers a good image of the capacity of correct identification of the method (Table 3). Using the threshold of 45% of correct classification of samples to consider each experimental tool as correctly classified (20% of correct classification would correspond to the random grouping in five categories), all the experimental tools can be considered as correctly grouped.

To test the real predictive capacity of the method, we blindly classified half of the samples against the other half. Using this procedure and considering 45% of correct classification of the samples from each tool as the threshold to consider each experimental tool as correctly classified, we obtained good predictive results. Eighteen tools were correctly classified, while two can be considered as indeterminate, in which the threshold of 45% of the samples is not reached for any on the five categories (Table 4).

Our classificatory method allows a good rate of correct determination for the five categories of plant gloss texture, finding significant differences between the tools used for cutting the five plant categories in terms of roughness, isotropy, wavelength, complexity, depth and density of furrows and slope of surface points (Table 5). The threshold of 45% of samples classified in one of the five groups permits a confident determination of the type of plant that was cut with the tool with a small risk of indetermination. For ensembles of tools, the proportion of samples grouped in the five categories provides a good image of the relative importance of the plants that were reaped with them. The main risks of misclassification can appear in samples corresponding to tools used to cut semi-ripe cereals that can be classified as cutting ripe cereals (21% of misclassification of 3D surfaces; Table 2) or tools used to cut reeds that can be classified as cutting green cereals (15.9% of misclassification of 3D surfaces; Table 2).

ARCHAEOLOGICAL RESULTS

215 archaeological tools recovered in 19 occupation phases from 12 archaeological sites located in the Middle Euphrates (Northern Levant) and Southern Levant dating from the 13th to the late 8th millennium cal BC were analyzed in this study.

The results of the analysis are listed according to the classification of individual tools in each archaeological site (see Table 1 in the Main Text). The classification of each tool is shown in Table 6. For this classification, when more than 50% of the surface samples are classified in one of the five plant cutting groups, the tool is identified as belonging to this group. If less than 50% of the surface samples are classified in the plant cutting groups, the tool is considered as indeterminate (Table 6). We have raised the threshold to 50% from the 45% used in the experimental tools to limit the risk of misclassification of archaeological tools.

The results can also be listed considering the proportion of samples classified in the five plant cutting groups. The results for Southern Levant are listed in Table 7 for Southern Levant and in Table 8 for Northern Levant.

In a previous version of our methodology 10, we only considered four categories of experimental plant cutting tools: domestic cereals, wild cereals in natural stands, wild cultivated cereals and reeds. The threshold of classification of archaeological tools in one of the groups was 60% of samples of 3D surfaces. We first identified the tools classified as used in reed cutting. Then, we classified the rest of the tools in the three categories of cereal cutting tools. Putting aside the indeterminate tools, we plotted the proportion of samples in the three categories by site/level in order to show the evolution of the degree of maturity of crops in the Middle Euphrates. However, in a later research 8 we tested that the classification of tools using texture analysis is more precise when it is carried out in one step than in successive ones. Thus, in our current approach we classify all the archaeological tools in the five experimental categories in one step. Moreover, for plotting the results by site/level we consider all the tools, without putting aside those classified as indeterminate, as we think that this procedure better shows the variability of gloss texture in archaeological sites/levels. Because of these changes, the results in the classification of the same tool can slightly vary from this study to the previous one, though the results are similar.

The index of the degree of maturity of harvested cereals per level/site (Table 9 for Northern Levant and Table 10 for Southern Levant) was calculated considering the results attributed to cereal harvesting in the three stages of maturity. For each site/level, the index is the result of adding the proportion of unripe harvesting multiplied by three, unripe harvesting by two and ripe harvesting by one. Thus, 300 would be the index of a site with exclusive unripe cutting and 100 in another one with exclusive ripe cutting.

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**Fig. 1.** Scheme of the processing of 3D surfaces before measuring texture

**Table 1.** The experimental program

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tool** | **Type of plant** | **Plant species** | **Year** | **Place** |
| 1 | Domestic cereal | *T. spelta* | 1994 | Zureda, Asturias (Spain) |
| 2  | Domestic cereal | *T. spelta* | 1994 | Zureda, Asturias (Spain) |
| 3 | Domestic cereal | *T. spelta* | 1994 | Zureda, Asturias (Spain) |
| 4 | Domestic cereal | *T. spelta* | 1994 | Zureda, Asturias (Spain) |
| 5 | Domestic cereal | *T. monoccocum* | 2008 | Seranon, Alpes-Maritimes (France) |
| 6 | Domestic cereal | *T. aestivum* *T.* *monococcum, T. dicoccum* | 1997 | Jalès, Ardèche (France) |
| 7 | Wild cereal in natural stands | *Hordeum spontaneum* and *T. diccocoides* | 2009 | Jebel el Arab (Syria) |
| 8 | Wild cereal in natural stands | *Hordeum spontaneum* and *T. diccocoides* | 2009 | Jebel el Arab (Syria) |
| 9 | Wild cereal in natural stands | *Hordeum spontaneum* and *T. diccocoides* | 2009 | Jebel el Arab (Syria) |
| 10 | Wild cereal in natural stands | *Hordeum spontaneum*  | 1993 | Jordan Valley (Israel) |
| 11 | Wild cereal in natural stands | *Hordeum spontaneum* | 1993 | Jordan Valley (Israel) |
| 12 | Wild cereal in natural stands | *T. boeticum* | 1995 | Jebel el Arab (Syria) |
| 13 | Wild cultivated  | *T. boeticum* | 1992 | Jalès (France) |
| 14 | Wild cultivated  | *T. boeticum* | 1992 | Jalès (France) |
| 15 | Wild cultivated  | *T. boeticum* | 1989 | Jalès (France) |
| 16 | Wild cultivated | *T. boeticum* | 1989 | Jalès (France) |
| 17 | Wild cultivated | *T. boeticum* | 1989 | Jalès (France)  |
| 18 | Reeds | *Phragmites communis* | 1993 | Jalès (France) |
| 19 | Reeds | *Phragmites communis* | 1993 | Jalès (France) |
| 20 | Grass | *Ampelodesmos mauritanica* | 2012 | Ain Salem (Tunisia) |

**Table 2.** Predicted group membership through quadratic discriminant classification of the experimental samples; 73% of original grouped cases correctly classified.

|  |  |  |
| --- | --- | --- |
|  | **Predicted group membership** |  |
| **Experimental group** | Ripe cereal | Semi-ripe cereal | Unripe cereal | Reeds | Grass | Total |
|  | **N** | **%** | **N** | **%** | **N** | **%** | **N** | **%** | **N** | **%** | **N** |
| Ripe cereal | 116 | 76.8 | 19 | 12.6 | 14 | 9.3 | 2 | 1.3 | 0 | 0 | 151 |
| Semi-ripe cereal | 22 | 21.0 | 69 | 65.7 | 8 | 7.6 | 5 | 4.8 | 1 | 1.0 | 112 |
| Unripe cereal | 10 | 8.9 | 12 | 10.7 | 82 | 73.2 | 8 | 7.1 | 0 | 0 | 105 |
| Reeds | 3 | 6.8 | 3 | 6.8 | 7 | 15.9 | 31 | 70.5 | 0 | 0 | 44 |
| Grass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 100 | 15 |

**Table 3**. Predicted group membership through quadratic discriminant classification of the samples of each experimental tool. Correct classification in green.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| N  |  | Domestic | Wild stands | Wild cultivated | Reeds | Grass | Total |
| 1 | Domestic | 17 | 85.0 | 0 | 0.0 | 3 | 15.0 | 0 | 0.0 | 0 | 0 | 20 |
| 2 | Domestic | 31 | 72.1 | 6 | 14.0 | 6 | 14.0 | 0 | 0.0 | 0 | 0 | 43 |
| 3 | Domestic | 17 | 70.8 | 5 | 20.8 | 2 | 8.3 | 0 | 0.0 | 0 | 0 | 24 |
| 4 | Domestic | 18 | 81.8 | 1 | 4.5 | 3 | 13.6 | 0 | 0.0 | 0 | 0 | 22 |
| 5 | Domestic | 10 | 55.6 | 1 | 5.6 | 5 | 27.8 | 2 | 11.1 | 0 | 0 | 18 |
| 6 | Domestic | 23 | 95.8 | 1 | 4.2 | 0 | 0.0 | 0 | 0.0 | 0 | 0 | 24 |
| 7 | Wild stands | 5 | 25.0 | 9 | 45.0 | 3 | 15.0 | 3 | 15.0 | 0 | 0 | 20 |
| 8 | Wild stands | 2 | 13.3 | 9 | 60.0 | 2 | 13.3 | 2 | 13.3 | 0 | 0 | 15 |
| 9 | Wild stands | 2 | 9.1 | 16 | 72.7 | 3 | 13.6 | 1 | 4.5 | 0 | 0 | 22 |
| 10 | Wild stands | 1 | 4.5 | 18 | 81.8 | 1 | 4.5 | 2 | 9.1 | 0 | 0 | 22 |
| 11 | Wild stands | 0 | 0.0 | 19 | 90.5 | 2 | 9.5 | 0 | 0.0 | 0 | 0 | 21 |
| 12 | Wild stands | 0 | 0.0 | 11 | 91.7 | 1 | 8.3 | 0 | 0.0 | 0 | 0 | 12 |
| 13 | Wild cultivated | 5 | 26.3 | 3 | 15.8 | 11 | 57.9 | 0 | 0.0 | 0 | 0 | 19 |
| 14 | Wild cultivated | 5 | 25.0 | 1 | 5.0 | 14 | 70.0 | 0 | 0.0 | 0 | 0 | 20 |
| 15 | Wild cultivated | 5 | 23.8 | 1 | 4.8 | 14 | 66.7 | 1 | 4.8 | 0 | 0 | 21 |
| 16 | Wild cultivated | 6 | 25.0 | 3 | 12.5 | 11 | 45.8 | 4 | 16.7 | 0 | 0 | 24 |
| 17 | Wild cultivated | 1 | 4.8 | 0 | 0.0 | 19 | 90.5 | 0 | 0.0 | 0 | 0 | 21 |
| 18 | Reeds | 3 | 14.3 | 5 | 23.8 | 1 | 4.8 | 12 | 57.1 | 0 | 0 | 21 |
| 19 | Reeds | 0 | 0.0 | 2 | 8.7 | 2 | 8.7 | 19 | 82.6 | 0 | 0 | 23 |
| 20 | Grass | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 15 | 100 | 15 |

**Table 4**. Predicted group membership through quadratic discriminant classification of the samples of each experimental tool after blindly classifying one half of the samples against the other half. Correct classification in green; indeterminate classification in yellow.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| N  |  | Domestic | Wild stands | Wild cultivated | Reeds | Grass | Total |
| 1 | Domestic | 7 | 70 | 1 | 10 | 2 | 20 | 0 | 0.0 | 0 | 0 | 10 |
| 2 | Domestic | 13 | 61.9 | 3 | 14.3 | 5 | 23.8 | 0 | 0.0 | 0 | 0 | 21 |
| 3 | Domestic | 9 | 75 | 2 | 16.6 | 0 | 0 | 0 | 0.0 | 1 | 0 | 12 |
| 4 | Domestic | 10 | 81.8 | 1 | 4.5 | 0 | 13.6 | 0 | 0.0 | 0 | 0 | 11 |
| 5 | Domestic | 5 | 55.5 | 0 | 5.6 | 3 | 33.3 | 1 | 11.1 | 0 | 0 | 9 |
| 6 | Domestic | 11 | 91.6 | 1 | 8.3 | 0 | 0.0 | 0 | 0.0 | 0 | 0 | 12 |
| 7 | Wild stands | 3 | 30 | 4 | 40 | 1 | 10 | 2 | 20 | 0 | 0 | 10 |
| 8 | Wild stands | 0 | 0 | 6 | 75 | 0 | 0 | 2 | 25 | 0 | 0 | 8 |
| 9 | Wild stands | 0 | 0 | 9 | 81.8 | 2 | 8.2 | 0 | 0 | 0 | 0 | 11 |
| 10 | Wild stands | 0 | 0 | 10 | 90.9 | 0 | 0 | 1 | 9.1 | 0 | 0 | 11 |
| 11 | Wild stands | 0 | 0.0 | 9 | 90 | 1 | 10 | 0 | 0.0 | 0 | 0 | 10 |
| 12 | Wild stands | 0 | 0.0 | 5 | 83.3 | 1 | 16.7 | 0 | 0.0 | 0 | 0 | 6 |
| 13 | Wild cultivated | 3 | 30 | 2 | 20 | 5 | 50 | 0 | 0.0 | 0 | 0 | 10 |
| 14 | Wild cultivated | 2 | 20 | 20 | 5.0 | 6 | 60 | 0 | 0.0 | 0 | 0 | 10 |
| 15 | Wild cultivated | 2 | 20 | 1 | 10 | 7 | 70 | 0 | 0 | 0 | 0 | 10 |
| 16 | Wild cultivated | 4 | 33.3 | 1 | 8.3 | 5 | 41.6 | 2 | 16.6 | 0 | 0 | 12 |
| 17 | Wild cultivated | 1 | 10 | 0 | 0.0 | 9 | 90 | 0 | 0.0 | 0 | 0 | 10 |
| 18 | Reeds | 2 | 18.2 | 1 | 9.1 | 1 | 9.1 | 7 | 63.6 | 0 | 0 | 11 |
| 19 | Reeds | 0 | 0.0 | 1 | 9.1 | 1 | 9.1 | 9 | 81.8 | 0 | 0 | 11 |
| 20 | Grass | 0 | 0.0 | 1 | 12.5 | 0 | 0.0 | 2 | 25 | 5 | 62.5 | 8 |

**Table 5.** Mean of the parameters of texture of the five experimental groups.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Meaning | Domestic | Wild cultivated | Wild innatural stands | Reeds | Grass |
| MDepthFur | Depth of furrows | 0,291 | 0,299 | 0,434 | 0,605 | 0,497 |
| MDenFur | Density of furrows | 1196 | 1187 | 1179 | 1149 | 1197 |
| Sa | Roughness | 0,108 | 0,115 | 0,170 | 0,225 | 0,197 |
| Sq | 0,165 | 0,174 | 0,249 | 0,347 | 0,285 |
| Sz | 2,277 | 2,617 | 3,060 | 5,005 | 4,957 |
| Sp | 1,686 | 1,930 | 2,098 | 3,727 | 2,565 |
| Sv | 1,454 | 1,745 | 1,881 | 2,950 | 2,392 |
| Str | Isotropy | 0,613 | 0,638 | 0,588 | 0,495 | 0,499 |
| Sal | Wavelength | 2,654 | 2,776 | 2,635 | 2,552 | 2,321 |
| Sdq | Slope of surface points | 0,122 | 0,130 | 0,185 | 0,282 | 0,216 |
| Sfd | Complexity | 2,507 | 2,526 | 2,555 | 2,484 | 2,557 |

**Table 6**. Classification of Archaeological tools

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Period** | **Site** | **Tool** | **N** | **%** |
|  |  |  | Ripe | Semi-Ripe | Unripe | Reeds | Grass | Total | Ripe | Semi-Ripe | Unripe | Reeds | Grass |
| LPPNB  | Tell Halula  | HL 2C 166  | 4 | 6 | 3 | 3 | 0 | 16 | 25,0 | 37,5 | 18,8 | 18,8 | 0,0 |
| LPPNB  | Tell Halula  | HL 2C 223  | 2 | 11 | 5 | 2 | 0 | 20 | 10,0 | 55,0 | 25,0 | 10,0 | 0,0 |
| LPPNB  | Tell Halula  | HL 2C 289  | 12 | 3 | 1 | 1 | 0 | 17 | 70,6 | 17,6 | 5,9 | 5,9 | 0,0 |
| LPPNB  | Tell Halula  | HL 2C 291  | 13 | 2 | 0 | 0 | 0 | 15 | 86,7 | 13,3 | 0,0 | 0,0 | 0,0 |
| LPPNB  | Tell Halula  | HL 2C 328  | 13 | 4 | 0 | 1 | 0 | 18 | 72,2 | 22,2 | 0,0 | 5,6 | 0,0 |
| LPPNB  | Tell Halula  | HL 2C 1  | 12 | 5 | 1 | 0 | 0 | 18 | 66,7 | 27,8 | 5,6 | 0,0 | 0,0 |
| LPPNB  | Tell Halula  | HL 2D 12  | 6 | 15 | 0 | 0 | 0 | 21 | 28,6 | 71,4 | 0,0 | 0,0 | 0,0 |
| LPPNB  | Tell Halula  | HL 2D 2  | 9 | 11 | 0 | 1 | 0 | 21 | 42,9 | 52,4 | 0,0 | 4,8 | 0,0 |
| LPPNB  | Tell Halula  | HL 2D 4  | 14 | 7 | 0 | 0 | 0 | 21 | 66,7 | 33,3 | 0,0 | 0,0 | 0,0 |
| LPPNB  | Tell Halula  | HL 2D 44  | 4 | 17 | 0 | 0 | 0 | 21 | 19,0 | 81,0 | 0,0 | 0,0 | 0,0 |
|  |  |  |  |  |  |  |  | Mean | 48,8 | 41,2 | 5,5 | 4,5 | 0,0 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MPPNB  | Tell Halula  | HL 4C  | 7 | 5 | 2 | 1 | 0 | 15 | 46,7 | 33,3 | 13,3 | 6,7 | 0,0 |
| MPPNB  | Tell Halula  | HL 4D A7  | 5 | 3 | 3 | 4 | 1 | 16 | 31,3 | 18,8 | 18,8 | 25,0 | 6,3 |
| MPPNB  | Tell Halula  | HL 4D E68  | 3 | 8 | 7 | 0 | 0 | 18 | 16,7 | 44,4 | 38,9 | 0,0 | 0,0 |
| MPPNB  | Tell Halula  | HL 4D element 1  | 13 | 2 | 2 | 1 | 0 | 18 | 72,2 | 11,1 | 11,1 | 5,6 | 0,0 |
| MPPNB  | Tell Halula  | HL 4D element 2  | 12 | 0 | 3 | 0 | 0 | 15 | 80,0 | 0,0 | 20,0 | 0,0 | 0,0 |
| MPPNB  | Tell Halula  | HL 4D element 3  | 10 | 6 | 2 | 0 | 0 | 18 | 55,6 | 33,3 | 11,1 | 0,0 | 0,0 |
| MPPNB  | Tell Halula  | HL 4D 103  | 17 | 11 | 0 | 0 | 0 | 28 | 60,7 | 39,3 | 0,0 | 0,0 | 0,0 |
| MPPNB  | Tell Halula  | HL 4D 131  | 9 | 11 | 0 | 8 | 0 | 28 | 32,1 | 39,3 | 0,0 | 28,6 | 0,0 |
| MPPNB  | Tell Halula  | HL 4D 98  | 12 | 9 | 0 | 0 | 0 | 21 | 57,1 | 42,9 | 0,0 | 0,0 | 0,0 |
|  |  |  |  |  |  |  |  | Mean | 50,3 | 29,2 | 12,6 | 7,3 | 0,7 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| EPPNB  | Mureybet  | Mb 72 500  | 10 | 8 | 2 | 0 | 0 | 20 | 50,0 | 40,0 | 10,0 | 0,0 | 0,0 |
| EPPNB  | Mureybet  | Mb 74 1461  | 2 | 11 | 5 | 0 | 0 | 18 | 11,1 | 61,1 | 27,8 | 0,0 | 0,0 |
| EPPNB  | Mureybet  | Mb 74 1614  | 12 | 6 | 0 | 0 | 0 | 18 | 66,7 | 33,3 | 0,0 | 0,0 | 0,0 |
| EPPNB  | Mureybet  | Mb 74 1728  | 17 | 1 | 0 | 0 | 0 | 18 | 94,4 | 5,6 | 0,0 | 0,0 | 0,0 |
| EPPNB  | Mureybet  | Mb 74 1779  | 1 | 4 | 9 | 1 | 2 | 17 | 5,9 | 23,5 | 52,9 | 5,9 | 11,8 |
| EPPNB  | Mureybet  | Mb 74 1837  | 0 | 3 | 7 | 3 | 3 | 16 | 0,0 | 18,8 | 43,8 | 18,8 | 18,8 |
| EPPNB  | Mureybet  | Mb 74 1857  | 13 | 6 | 1 | 0 | 0 | 20 | 65,0 | 30,0 | 5,0 | 0,0 | 0,0 |
| EPPNB  | Mureybet  | MB IVA 1679  | 10 | 9 | 0 | 2 | 0 | 21 | 47,6 | 42,9 | 0,0 | 9,5 | 0,0 |
| EPPNB  | Mureybet  | MB IVA 1976  | 1 | 20 | 0 | 0 | 0 | 21 | 4,8 | 95,2 | 0,0 | 0,0 | 0,0 |
| EPPNB  | Mureybet  | MB IVA 2779  | 5 | 16 | 0 | 0 | 0 | 21 | 23,8 | 76,2 | 0,0 | 0,0 | 0,0 |
|  |  |  |  |  |  |  |  | Mean | 36,9 | 42,7 | 13,9 | 3,4 | 3,1 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| PPNA  | Mureybet  | Mb 74 1236  | 11 | 6 | 1 | 0 | 0 | 18 | 61,1 | 33,3 | 5,6 | 0,0 | 0,0 |
| PPNA  | Mureybet  | Mb 74 1384  | 1 | 1 | 15 | 1 | 0 | 18 | 5,6 | 5,6 | 83,3 | 5,6 | 0,0 |
| PPNA  | Mureybet  | Mb 74 2132  | 5 | 5 | 5 | 0 | 0 | 15 | 33,3 | 33,3 | 33,3 | 0,0 | 0,0 |
| PPNA  | Mureybet  | Mb IIIA 2135  | 0 | 0 | 0 | 18 | 0 | 18 | 0,0 | 0,0 | 0,0 | 100,0 | 0,0 |
| PPNA  | Mureybet  | Mb 74 2287  | 0 | 3 | 11 | 3 | 0 | 17 | 0,0 | 17,6 | 64,7 | 17,6 | 0,0 |
| PPNA  | Mureybet  | Mb 74 2976  | 3 | 13 | 0 | 0 | 1 | 17 | 17,6 | 76,5 | 0,0 | 0,0 | 5,9 |
| PPNA  | Mureybet  | Mb 73 1031  | 3 | 3 | 1 | 3 | 1 | 11 | 27,3 | 27,3 | 9,1 | 27,3 | 9,1 |
| PPNA  | Mureybet  | Mb 73 1034  | 10 | 8 | 0 | 0 | 0 | 18 | 55,6 | 44,4 | 0,0 | 0,0 | 0,0 |
| PPNA  | Mureybet  | Mb 73 779  | 6 | 9 | 3 | 0 | 0 | 18 | 33,3 | 50,0 | 16,7 | 0,0 | 0,0 |
| PPNA  | Mureybet  | Mb 74 303  | 7 | 0 | 10 | 1 | 0 | 18 | 38,9 | 0,0 | 55,6 | 5,6 | 0,0 |
| PPNA  | Mureybet  | Mb 74 5509  | 9 | 9 | 0 | 0 | 0 | 18 | 50,0 | 50,0 | 0,0 | 0,0 | 0,0 |
| PPNA  | Mureybet  | Mb IIIA 313  | 2 | 18 | 0 | 1 | 0 | 21 | 9,5 | 85,7 | 0,0 | 4,8 | 0,0 |
| PPNA  | Mureybet  | Mb IIIA 9135  | 11 | 10 | 0 | 0 | 0 | 21 | 52,4 | 47,6 | 0,0 | 0,0 | 0,0 |
|  |  |  |  |  |  |  |  | Mean | 29,6 | 36,3 | 20,6 | 12,4 | 1,2 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Natufian  | Mureybet  | Mb Q33 B4  | 0 | 12 | 0 | 0 | 0 | 12 | 0,0 | 100,0 | 0,0 | 0,0 | 0,0 |
| Natufian  | Mureybet  | Mb 71 Q33 B4 3888  | 0 | 5 | 9 | 3 | 1 | 18 | 0,0 | 27,8 | 50,0 | 16,7 | 5,6 |
| Epi-Natufian  | Mureybet  | Mb 73 6430  | 2 | 15 | 2 | 0 | 0 | 19 | 10,5 | 78,9 | 10,5 | 0,0 | 0,0 |
| Natufian  | Abu Hureyra  | PA 21  | 5 | 24 | 0 | 0 | 0 | 29 | 17,2 | 82,8 | 0,0 | 0,0 | 0,0 |
| Natufian  | Abu Hureyra  | PA 22  | 10 | 7 | 4 | 0 | 0 | 21 | 47,6 | 33,3 | 19,0 | 0,0 | 0,0 |
| Natufian  | Abu Hureyra  | AH 73 E271 F449  | 0 | 4 | 9 | 6 | 2 | 21 | 0,0 | 19,0 | 42,9 | 28,6 | 9,5 |
| Natufian  | Abu Hureyra  | PA Abu Hureyra  | 3 | 3 | 6 | 5 | 1 | 18 | 16,7 | 16,7 | 33,3 | 27,8 | 5,6 |
|  |  |  |  |  |  |  |  | Mean | 13,1 | 51,2 | 22,2 | 10,4 | 3,0 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MPPNB  | Abu Hureyra  | AH72 23 F47 1  | 17 | 4 | 0 | 0 | 0 | 21 | 81,0 | 19,0 | 0,0 | 0,0 | 0,0 |
| MPPNB  | Abu Hureyra  | AH72D 32 F71  | 0 | 21 | 0 | 0 | 0 | 21 | 0,0 | 100,0 | 0,0 | 0,0 | 0,0 |
| MPPNB  | Abu Hureyra  | AH72D 66 F116  | 6 | 16 | 0 | 1 | 0 | 23 | 26,1 | 69,6 | 0,0 | 4,3 | 0,0 |
| MPPNB  | Abu Hureyra  | AH 73 G 48 F85  | 8 | 13 | 0 | 1 | 0 | 22 | 36,4 | 59,1 | 0,0 | 4,5 | 0,0 |
| MPPNB  | Abu Hureyra  | AH 83 F131  | 3 | 18 | 0 | 0 | 0 | 21 | 14,3 | 85,7 | 0,0 | 0,0 | 0,0 |
|  |  |  |  |  |  |  |  | Mean | 31,6 | 66,7 | 0,0 | 1,8 | 0,0 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Natufian  | Hayonim T.  | HT 79 P.352 fig 3  | 1 | 10 | 9 | 1 | 0 | 21 | 4,8 | 47,6 | 42,9 | 4,8 | 0,0 |
| Natufian  | Hayonim T.  | HT 80 326-10 J32c  | 0 | 2 | 7 | 9 | 1 | 19 | 0,0 | 10,5 | 36,8 | 47,4 | 5,3 |
| Natufian  | Hayonim T.  | HT 80 339-88 J31B  | 6 | 1 | 10 | 5 | 2 | 24 | 25,0 | 4,2 | 41,7 | 20,8 | 8,3 |
| Natufian  | Hayonim T.  | HT 81 353-4 L31b  | 0 | 0 | 5 | 10 | 0 | 15 | 0,0 | 0,0 | 33,3 | 66,7 | 0,0 |
| Natufian  | Hayonim T.  | HT 81 354-15 L31e  | 0 | 0 | 3 | 18 | 0 | 21 | 0,0 | 0,0 | 14,3 | 85,7 | 0,0 |
| Natufian  | Hayonim T.  | HT 81 470-4 K31d  | 5 | 4 | 12 | 0 | 0 | 21 | 23,8 | 19,0 | 57,1 | 0,0 | 0,0 |
| Natufian  | Hayonim T.  | HT 81 C1c 446  | 0 | 0 | 16 | 5 | 0 | 21 | 0,0 | 0,0 | 76,2 | 23,8 | 0,0 |
| Natufian  | Hayonim T.  | HT 81 K31B 427  | 1 | 0 | 15 | 5 | 0 | 21 | 4,8 | 0,0 | 71,4 | 23,8 | 0,0 |
| Natufian  | Hayonim T.  | HT 816 I31C 1412  | 3 | 5 | 2 | 5 | 6 | 21 | 14,3 | 23,8 | 9,5 | 23,8 | 28,6 |
| Natufian  | Hayonim T.  | HT 83 3013  | 9 | 2 | 2 | 8 | 0 | 21 | 42,9 | 9,5 | 9,5 | 38,1 | 0,0 |
| Natufian  | Hayonim T.  | HT 85 1071 27M 32a  | 5 | 4 | 11 | 0 | 1 | 21 | 23,8 | 19,0 | 52,4 | 0,0 | 4,8 |
| Natufian  | Hayonim T.  | HT 86 1508-1 I32c  | 1 | 0 | 6 | 8 | 5 | 20 | 5,0 | 0,0 | 30,0 | 40,0 | 25,0 |
| Natufian  | Hayonim T.  | HT 86 1665  | 6 | 2 | 8 | 5 | 0 | 21 | 28,6 | 9,5 | 38,1 | 23,8 | 0,0 |
| Natufian  | Hayonim T.  | HT 87 2130 L35a-32  | 1 | 9 | 2 | 9 | 0 | 21 | 4,8 | 42,9 | 9,5 | 42,9 | 0,0 |
| Natufian  | Hayonim T.  | HT 87 I32b 1833-12  | 4 | 4 | 9 | 2 | 0 | 19 | 21,1 | 21,1 | 47,4 | 10,5 | 0,0 |
| Natufian  | Hayonim T.  | HT 89 3189 N74d 505  | 0 | 4 | 6 | 11 | 0 | 21 | 0,0 | 19,0 | 28,6 | 52,4 | 0,0 |
| Natufian  | Hayonim T.  | HT 89 3198 L32a  | 0 | 0 | 3 | 18 | 0 | 21 | 0,0 | 0,0 | 14,3 | 85,7 | 0,0 |
| Natufian  | Hayonim T.  | HT without number  | 3 | 2 | 7 | 6 | 2 | 20 | 15,0 | 10,0 | 35,0 | 30,0 | 10,0 |
|  |  |  |  |  |  |  |  | Mean | 11,9 | 13,1 | 36,0 | 34,5 | 4,6 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| EPPNB  | Dja'de  | DJ 1024 1.mnt  | 7 | 8 | 0 | 7 | 2 | 24 | 29,2 | 33,3 | 0,0 | 29,2 | 8,3 |
| EPPNB  | Dja'de  | DJ 1027 1.mnt  | 2 | 20 | 1 | 1 | 0 | 24 | 8,3 | 83,3 | 4,2 | 4,2 | 0,0 |
| EPPNB  | Dja'de  | DJ 1031 1.mnt  | 2 | 19 | 2 | 1 | 0 | 24 | 8,3 | 79,2 | 8,3 | 4,2 | 0,0 |
| EPPNB  | Dja'de  | DJ 1040 1.mnt  | 15 | 4 | 0 | 5 | 0 | 24 | 62,5 | 16,7 | 0,0 | 20,8 | 0,0 |
| EPPNB  | Dja'de  | DJ 1043 1.mnt  | 0 | 1 | 3 | 11 | 9 | 24 | 0,0 | 4,2 | 12,5 | 45,8 | 37,5 |
| EPPNB  | Dja'de  | DJ 1069 1.mnt  | 19 | 3 | 0 | 1 | 1 | 24 | 79,2 | 12,5 | 0,0 | 4,2 | 4,2 |
| EPPNB  | Dja'de  | DJ 1079 1.mnt  | 1 | 1 | 0 | 4 | 18 | 24 | 4,2 | 4,2 | 0,0 | 16,7 | 75,0 |
| EPPNB  | Dja'de  | DJ 1094 1.mnt  | 10 | 13 | 0 | 1 | 0 | 24 | 41,7 | 54,2 | 0,0 | 4,2 | 0,0 |
| EPPNB  | Dja'de  | DJ 1207 1.mnt  | 7 | 7 | 0 | 8 | 2 | 24 | 29,2 | 29,2 | 0,0 | 33,3 | 8,3 |
| EPPNB  | Dja'de  | DJ 1281 1.mnt  | 13 | 4 | 1 | 3 | 3 | 24 | 54,2 | 16,7 | 4,2 | 12,5 | 12,5 |
| EPPNB  | Dja'de  | DJ 17 1.mnt  | 3 | 16 | 0 | 2 | 2 | 23 | 13,0 | 69,6 | 0,0 | 8,7 | 8,7 |
| EPPNB  | Dja'de  | DJ 2045 1.mnt  | 10 | 10 | 0 | 4 | 0 | 24 | 41,7 | 41,7 | 0,0 | 16,7 | 0,0 |
| EPPNB  | Dja'de  | DJ 2049 1.mnt  | 6 | 13 | 0 | 1 | 4 | 24 | 25,0 | 54,2 | 0,0 | 4,2 | 16,7 |
| EPPNB  | Dja'de  | DJ 2057 1.mnt  | 12 | 5 | 0 | 6 | 1 | 24 | 50,0 | 20,8 | 0,0 | 25,0 | 4,2 |
| EPPNB  | Dja'de  | DJ 2094 1.mnt  | 15 | 4 | 0 | 5 | 0 | 24 | 62,5 | 16,7 | 0,0 | 20,8 | 0,0 |
| EPPNB  | Dja'de  | DJ 2137 1.mnt  | 3 | 11 | 2 | 4 | 4 | 24 | 12,5 | 45,8 | 8,3 | 16,7 | 16,7 |
| EPPNB  | Dja'de  | DJ 2139 1.mnt  | 2 | 13 | 0 | 8 | 1 | 24 | 8,3 | 54,2 | 0,0 | 33,3 | 4,2 |
| EPPNB  | Dja'de  | DJ 2167 1.mnt  | 6 | 15 | 1 | 1 | 1 | 24 | 25,0 | 62,5 | 4,2 | 4,2 | 4,2 |
| EPPNB  | Dja'de  | DJ 2208 1.mnt  | 7 | 7 | 0 | 5 | 1 | 20 | 35,0 | 35,0 | 0,0 | 25,0 | 5,0 |
| EPPNB  | Dja'de  | DJ 2244 1.mnt  | 9 | 8 | 0 | 7 | 0 | 24 | 37,5 | 33,3 | 0,0 | 29,2 | 0,0 |
| EPPNB  | Dja'de  | DJ 2248 1.mnt  | 9 | 5 | 1 | 4 | 5 | 24 | 37,5 | 20,8 | 4,2 | 16,7 | 20,8 |
| EPPNB  | Dja'de  | DJ 2251 1.mnt  | 4 | 1 | 0 | 10 | 8 | 23 | 17,4 | 4,3 | 0,0 | 43,5 | 34,8 |
| EPPNB  | Dja'de  | DJ 2256 1.mnt  | 4 | 14 | 0 | 5 | 1 | 24 | 16,7 | 58,3 | 0,0 | 20,8 | 4,2 |
| EPPNB  | Dja'de  | DJ 2393 1.mnt  | 7 | 10 | 0 | 5 | 2 | 24 | 29,2 | 41,7 | 0,0 | 20,8 | 8,3 |
| EPPNB  | Dja'de  | DJ 24 1.mnt  | 1 | 18 | 0 | 3 | 2 | 24 | 4,2 | 75,0 | 0,0 | 12,5 | 8,3 |
| EPPNB  | Dja'de  | DJ 244 1.mnt  | 2 | 20 | 1 | 1 | 0 | 24 | 8,3 | 83,3 | 4,2 | 4,2 | 0,0 |
| EPPNB  | Dja'de  | DJ 26 1.mnt  | 5 | 4 | 0 | 4 | 11 | 24 | 20,8 | 16,7 | 0,0 | 16,7 | 45,8 |
| EPPNB  | Dja'de  | DJ 289 1.mnt  | 8 | 11 | 1 | 2 | 2 | 24 | 33,3 | 45,8 | 4,2 | 8,3 | 8,3 |
| EPPNB  | Dja'de  | DJ 293 1.mnt  | 7 | 15 | 0 | 2 | 0 | 24 | 29,2 | 62,5 | 0,0 | 8,3 | 0,0 |
| EPPNB  | Dja'de  | DJ 300 1.mnt  | 1 | 2 | 0 | 4 | 17 | 24 | 4,2 | 8,3 | 0,0 | 16,7 | 70,8 |
| EPPNB  | Dja'de  | DJ 3048 1.mnt  | 0 | 0 | 3 | 6 | 15 | 24 | 0,0 | 0,0 | 12,5 | 25,0 | 62,5 |
| EPPNB  | Dja'de  | DJ 3076 1.mnt  | 7 | 5 | 0 | 7 | 5 | 24 | 29,2 | 20,8 | 0,0 | 29,2 | 20,8 |
| EPPNB  | Dja'de  | DJ 3100 1.mnt  | 0 | 14 | 1 | 2 | 6 | 23 | 0,0 | 60,9 | 4,3 | 8,7 | 26,1 |
| EPPNB  | Dja'de  | DJ 3135 1.mnt  | 7 | 2 | 0 | 5 | 10 | 24 | 29,2 | 8,3 | 0,0 | 20,8 | 41,7 |
| EPPNB  | Dja'de  | DJ 3145 1.mnt  | 1 | 15 | 3 | 0 | 5 | 24 | 4,2 | 62,5 | 12,5 | 0,0 | 20,8 |
| EPPNB  | Dja'de  | DJ 315 1.mnt  | 0 | 7 | 1 | 2 | 14 | 24 | 0,0 | 29,2 | 4,2 | 8,3 | 58,3 |
| EPPNB  | Dja'de  | DJ 3162 1.mnt  | 10 | 3 | 0 | 10 | 1 | 24 | 41,7 | 12,5 | 0,0 | 41,7 | 4,2 |
| EPPNB  | Dja'de  | DJ 3235 1.mnt  | 9 | 9 | 3 | 3 | 0 | 24 | 37,5 | 37,5 | 12,5 | 12,5 | 0,0 |
| EPPNB  | Dja'de  | DJ 3308 1.mnt  | 1 | 22 | 0 | 1 | 0 | 24 | 4,2 | 91,7 | 0,0 | 4,2 | 0,0 |
| EPPNB  | Dja'de  | DJ 3316 1.mnt  | 15 | 5 | 1 | 3 | 0 | 24 | 62,5 | 20,8 | 4,2 | 12,5 | 0,0 |
| EPPNB  | Dja'de  | DJ 354 1.mnt  | 5 | 10 | 1 | 5 | 3 | 24 | 20,8 | 41,7 | 4,2 | 20,8 | 12,5 |
| EPPNB  | Dja'de  | DJ 376 1.mnt  | 2 | 18 | 1 | 3 | 0 | 24 | 8,3 | 75,0 | 4,2 | 12,5 | 0,0 |
| EPPNB  | Dja'de  | DJ 3913 1.mnt  | 3 | 16 | 0 | 4 | 1 | 24 | 12,5 | 66,7 | 0,0 | 16,7 | 4,2 |
| EPPNB  | Dja'de  | DJ 438 1.mnt  | 4 | 2 | 1 | 9 | 8 | 24 | 16,7 | 8,3 | 4,2 | 37,5 | 33,3 |
| EPPNB  | Dja'de  | DJ 5019 1.mnt  | 4 | 10 | 0 | 1 | 9 | 24 | 16,7 | 41,7 | 0,0 | 4,2 | 37,5 |
| EPPNB  | Dja'de  | DJ 8 1.mnt  | 14 | 9 | 0 | 1 | 0 | 24 | 58,3 | 37,5 | 0,0 | 4,2 | 0,0 |
| EPPNB  | Dja'de  | DJ 81 1.mnt  | 9 | 0 | 0 | 4 | 11 | 24 | 37,5 | 0,0 | 0,0 | 16,7 | 45,8 |
| EPPNB  | Dja'de  | DJ 92 1.mnt  | 17 | 4 | 0 | 3 | 0 | 24 | 70,8 | 16,7 | 0,0 | 12,5 | 0,0 |
|  |  |  |  |  |  |  |  | Mean | 26,6 | 37,8 | 2,4 | 17,0 | 16,1 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MPPNB  | Nahal Hemar  | NH 2008 756 A  | 20 | 4 | 0 | 3 | 0 | 27 | 74,1 | 14,8 | 0,0 | 11,1 | 0,0 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MPPNB  | Kharaysin  | Kh U60 1E-1A UE318  | 8 | 9 | 0 | 0 | 0 | 17 | 47,1 | 52,9 | 0,0 | 0,0 | 0,0 |
| MPPNB  | Kharaysin  | Kh G100 204  | 15 | 3 | 0 | 0 | 0 | 18 | 83,3 | 16,7 | 0,0 | 0,0 | 0,0 |
| MPPNB  | Kharaysin  | Kh SUP.  | 18 | 3 | 0 | 0 | 0 | 21 | 85,7 | 14,3 | 0,0 | 0,0 | 0,0 |
| MPPNB  | Kharaysin  | Kh U60 1E 318  | 16 | 1 | 1 | 1 | 0 | 19 | 84,2 | 5,3 | 5,3 | 5,3 | 0,0 |
| MPPNB  | Kharaysin  | Kh UE7 2237  | 22 | 2 | 0 | 0 | 0 | 24 | 91,7 | 8,3 | 0,0 | 0,0 | 0,0 |
| MPPNB  | Kharaysin  | Kh V55 3609  | 12 | 8 | 1 | 0 | 0 | 21 | 57,1 | 38,1 | 4,8 | 0,0 | 0,0 |
| MPPNB  | Kharaysin  | Kh W60 UE314  | 20 | 4 | 0 | 0 | 0 | 24 | 83,3 | 16,7 | 0,0 | 0,0 | 0,0 |
| MPPNB  | Kharaysin  | Kh H100 UE7  | 23 | 1 | 0 | 0 | 0 | 24 | 95,8 | 4,2 | 0,0 | 0,0 | 0,0 |
|  |  |  |  |  |  |  |  | Mean | 78,5 | 19,6 | 1,3 | 0,7 | 0,0 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| EPPNB  | Kharaysin  | Kh C55 652 2BIS  | 21 | 0 | 1 | 0 | 0 | 22 | 95,5 | 0,0 | 4,5 | 0,0 | 0,0 |
| EPPNB  | Kharaysin  | Kh C55 512  | 24 | 4 | 0 | 0 | 0 | 28 | 85,7 | 14,3 | 0,0 | 0,0 | 0,0 |
| EPPNB  | Kharaysin  | Kh C55 652 1  | 19 | 3 | 1 | 1 | 0 | 24 | 79,2 | 12,5 | 4,2 | 4,2 | 0,0 |
| EPPNB  | Kharaysin  | Kh C55 652 2  | 0 | 3 | 21 | 4 | 0 | 28 | 0,0 | 10,7 | 75,0 | 14,3 | 0,0 |
| EPPNB  | Kharaysin  | Kh E55 551 21996  | 18 | 2 | 1 | 3 | 0 | 24 | 75,0 | 8,3 | 4,2 | 12,5 | 0,0 |
| EPPNB  | Kharaysin  | Kh F55 703 21760 1  | 23 | 1 | 0 | 0 | 0 | 24 | 95,8 | 4,2 | 0,0 | 0,0 | 0,0 |
| EPPNB  | Kharaysin  | Kh F55 703 21760 2  | 28 | 0 | 0 | 0 | 0 | 28 | 100,0 | 0,0 | 0,0 | 0,0 | 0,0 |
|  |  |  |  |  |  |  |  | Mean | 75,9 | 7,1 | 12,6 | 4,4 | 0,0 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| PPNA  | Kharaysin  | Kh 2018 B50 1  | 2 | 14 | 0 | 8 | 0 | 24 | 8,3 | 58,3 | 0,0 | 33,3 | 0,0 |
| PPNA  | Kharaysin  | Kh 2018 C55 1  | 8 | 9 | 0 | 6 | 1 | 24 | 33,3 | 37,5 | 0,0 | 25,0 | 4,2 |
| PPNA  | Kharaysin  | Kh 2018 D50 1  | 4 | 9 | 0 | 6 | 5 | 24 | 16,7 | 37,5 | 0,0 | 25,0 | 20,8 |
|  |  |  |  |  |  |  |  | Mean | 19,4 | 44,4 | 0,0 | 27,8 | 8,3 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LPPNA  | Jerf el Ahmar  | JF 25 23 3-1  | 21 | 3 | 0 | 0 | 0 | 24 | 87,5 | 12,5 | 0,0 | 0,0 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF A7918-1  | 14 | 10 | 0 | 0 | 0 | 24 | 58,3 | 41,7 | 0,0 | 0,0 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF B25 2-1  | 6 | 18 | 0 | 0 | 0 | 24 | 25,0 | 75,0 | 0,0 | 0,0 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF B83 2-1  | 16 | 7 | 1 | 0 | 0 | 24 | 66,7 | 29,2 | 4,2 | 0,0 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF C 281-1  | 11 | 11 | 2 | 0 | 0 | 24 | 45,8 | 45,8 | 8,3 | 0,0 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF E17 35-1  | 0 | 8 | 16 | 0 | 0 | 24 | 0,0 | 33,3 | 66,7 | 0,0 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF E1825-1  | 2 | 9 | 8 | 0 | 0 | 19 | 10,5 | 47,4 | 42,1 | 0,0 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF E84 4-1  | 7 | 1 | 9 | 4 | 0 | 21 | 33,3 | 4,8 | 42,9 | 19,0 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF F30 10-1  | 6 | 19 | 0 | 0 | 0 | 25 | 24,0 | 76,0 | 0,0 | 0,0 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF H81 6A-1  | 20 | 4 | 0 | 0 | 0 | 24 | 83,3 | 16,7 | 0,0 | 0,0 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF H81 6B-1  | 15 | 8 | 0 | 0 | 0 | 23 | 65,2 | 34,8 | 0,0 | 0,0 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF ZV 21 14-1  | 13 | 7 | 0 | 0 | 0 | 20 | 65,0 | 35,0 | 0,0 | 0,0 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF ZV 21 3-1  | 13 | 3 | 6 | 0 | 1 | 23 | 56,5 | 13,0 | 26,1 | 0,0 | 4,3 |
| LPPNA  | Jerf el Ahmar  | JF ZW 25 1-1  | 4 | 1 | 9 | 1 | 0 | 15 | 26,7 | 6,7 | 60,0 | 6,7 | 0,0 |
| LPPNA  | Jerf el Ahmar  | JF ZW 25 2-1  | 7 | 3 | 12 | 2 | 0 | 24 | 29,2 | 12,5 | 50,0 | 8,3 | 0,0 |
|  |  |  |  |  |  |  |  |  | 45,1 | 32,3 | 20,0 | 2,3 | 0,3 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LPPNB  | Ba'ja  | B 22242 C20-62 A1  | 14 | 9 | 0 | 1 | 0 | 24 | 58,3 | 37,5 | 0,0 | 4,2 | 0,0 |
| LPPNB  | Ba'ja  | B92073 C22-R6-12 A1  | 4 | 18 | 1 | 1 | 0 | 24 | 16,7 | 75,0 | 4,2 | 4,2 | 0,0 |
|  |  |  |  |  |  |  |  | Mean | 37,5 | 56,3 | 2,1 | 4,2 | 0,0 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| EPPNB  | T. Qarassa N | TQN 14 53 A 3-  | 1 | 17 | 4 | 1 | 0 | 23 | 4,3 | 73,9 | 17,4 | 4,3 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V17 14 1  | 10 | 4 | 7 | 1 | 0 | 22 | 45,5 | 18,2 | 31,8 | 4,5 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V17 14 2  | 22 | 0 | 0 | 0 | 0 | 22 | 100,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V67 1 4  | 22 | 1 | 0 | 0 | 0 | 23 | 95,7 | 4,3 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V67 10 1  | 10 | 9 | 7 | 0 | 0 | 26 | 38,5 | 34,6 | 26,9 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V67 10  | 20 | 1 | 4 | 1 | 0 | 26 | 76,9 | 3,8 | 15,4 | 3,8 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V67 14 245  | 18 | 7 | 1 | 0 | 0 | 26 | 69,2 | 26,9 | 3,8 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V67 15 270  | 4 | 7 | 7 | 1 | 0 | 19 | 21,1 | 36,8 | 36,8 | 5,3 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V67 2 285  | 1 | 12 | 7 | 0 | 0 | 20 | 5,0 | 60,0 | 35,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V67 2 289  | 16 | 1 | 1 | 1 | 0 | 19 | 84,2 | 5,3 | 5,3 | 5,3 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V67 3 23  | 21 | 1 | 1 | 0 | 0 | 23 | 91,3 | 4,3 | 4,3 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V67 4 1  | 11 | 7 | 2 | 2 | 0 | 22 | 50,0 | 31,8 | 9,1 | 9,1 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V67 4 135  | 11 | 8 | 3 | 0 | 0 | 22 | 50,0 | 36,4 | 13,6 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN V67 4 2  | 14 | 6 | 0 | 0 | 0 | 20 | 70,0 | 30,0 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 24 62  | 12 | 4 | 10 | 1 | 0 | 27 | 44,4 | 14,8 | 37,0 | 3,7 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 24 C4D 2  | 14 | 6 | 3 | 1 | 0 | 24 | 58,3 | 25,0 | 12,5 | 4,2 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 24 C4D1  | 13 | 1 | 0 | 0 | 0 | 14 | 92,9 | 7,1 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 29 107 1-  | 12 | 3 | 9 | 0 | 0 | 24 | 50,0 | 12,5 | 37,5 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 6 300  | 30 | 3 | 0 | 2 | 0 | 35 | 85,7 | 8,6 | 0,0 | 5,7 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 A1 25 11294  | 23 | 1 | 0 | 0 | 0 | 24 | 95,8 | 4,2 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 E1 25  | 17 | 4 | 2 | 1 | 0 | 24 | 70,8 | 16,7 | 8,3 | 4,2 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 E2 24  | 21 | 5 | 7 | 1 | 0 | 34 | 61,8 | 14,7 | 20,6 | 2,9 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 E2 25 11285 A  | 0 | 0 | 7 | 10 | 0 | 17 | 0,0 | 0,0 | 41,2 | 58,8 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 E2 25 11285 B  | 0 | 12 | 14 | 2 | 0 | 28 | 0,0 | 42,9 | 50,0 | 7,1 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 E2 25 11287 | 10 | 3 | 6 | 1 | 0 | 20 | 50,0 | 15,0 | 30,0 | 5,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 E8 25 11078 A  | 21 | 0 | 1 | 1 | 0 | 23 | 91,3 | 0,0 | 4,3 | 4,3 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y67 E8 25 11078 B  | 6 | 13 | 2 | 3 | 0 | 24 | 25,0 | 54,2 | 8,3 | 12,5 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 1  | 22 | 1 | 1 | 0 | 0 | 24 | 91,7 | 4,2 | 4,2 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 21  | 24 | 0 | 0 | 0 | 0 | 24 | 100,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 24  | 1 | 1 | 14 | 4 | 2 | 22 | 4,5 | 4,5 | 63,6 | 18,2 | 9,1 |
| EPPNB  | T. Qarassa N | TQN Y68 24 199  | 17 | 6 | 1 | 0 | 0 | 24 | 70,8 | 25,0 | 4,2 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 29 132  | 23 | 2 | 0 | 2 | 0 | 27 | 85,2 | 7,4 | 0,0 | 7,4 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 29 B  | 14 | 5 | 1 | 3 | 0 | 23 | 60,9 | 21,7 | 4,3 | 13,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 52C 11159  | 24 | 0 | 0 | 0 | 0 | 24 | 100,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 A1 24  | 9 | 5 | 7 | 1 | 2 | 24 | 37,5 | 20,8 | 29,2 | 4,2 | 8,3 |
| EPPNB  | T. Qarassa N | TQN Y68 A2 25 258  | 23 | 1 | 0 | 0 | 0 | 24 | 95,8 | 4,2 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 A3 24B  | 13 | 9 | 2 | 0 | 0 | 24 | 54,2 | 37,5 | 8,3 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 B3 40 120  | 24 | 0 | 0 | 0 | 0 | 24 | 100,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 C3 11251  | 17 | 7 | 0 | 0 | 0 | 24 | 70,8 | 29,2 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 C3 52 11198  | 12 | 9 | 3 | 0 | 0 | 24 | 50,0 | 37,5 | 12,5 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 C3 52 11210  | 28 | 0 | 0 | 0 | 0 | 28 | 100,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 C5 52  | 3 | 14 | 4 | 1 | 0 | 22 | 13,6 | 63,6 | 18,2 | 4,5 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 C5 52B 11134  | 28 | 0 | 0 | 0 | 0 | 28 | 100,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 C5 52C 11133  | 3 | 18 | 1 | 0 | 0 | 22 | 13,6 | 81,8 | 4,5 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 D4 52 11262  | 8 | 0 | 11 | 3 | 2 | 24 | 33,3 | 0,0 | 45,8 | 12,5 | 8,3 |
| EPPNB  | T. Qarassa N | TQN Y68 DE-45 27  | 23 | 1 | 0 | 0 | 0 | 24 | 95,8 | 4,2 | 0,0 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 E3 14 1  | 16 | 4 | 3 | 1 | 0 | 24 | 66,7 | 16,7 | 12,5 | 4,2 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y68 E3 14 2  | 22 | 1 | 0 | 0 | 1 | 24 | 91,7 | 4,2 | 0,0 | 0,0 | 4,2 |
| EPPNB  | T. Qarassa N | TQN Y68 E3 14  | 20 | 0 | 3 | 0 | 5 | 28 | 71,4 | 0,0 | 10,7 | 0,0 | 17,9 |
| EPPNB  | T. Qarassa N | TQN Y69 C4 52 A  | 2 | 9 | 13 | 0 | 0 | 24 | 8,3 | 37,5 | 54,2 | 0,0 | 0,0 |
| EPPNB  | T. Qarassa N | TQN Y69 C4 52 B  | 4 | 3 | 15 | 2 | 0 | 24 | 16,7 | 12,5 | 62,5 | 8,3 | 0,0 |
|  |  |  |  |  |  |  |  | Mean | 60,0 | 19,5 | 15,4 | 4,2 | 0,9 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Natufian  | Shubaiqa 1  | CM004 Sh1  | 0 | 15 | 0 | 8 | 5 | 28 | 0 | 53,6 | 0 | 28,6 | 17,9 |
| Natufian  | Shubaiqa 1  | CM005 Sh1  | 0 | 8 | 0 | 13 | 6 | 27 | 0 | 29,6 | 0 | 48,1 | 22,2 |
| Natufian  | Shubaiqa 1  | CM006 Sh1  | 0 | 4 | 0 | 7 | 13 | 24 | 0 | 16,7 | 0 | 29,2 | 54,2 |
| Natufian  | Shubaiqa 1  | CM007 Sh1  | 0 | 3 | 0 | 15 | 5 | 23 | 0 | 13,0 | 0 | 65,2 | 21,7 |
| Natufian  | Shubaiqa 6  | CM031 Sh6  | 0 | 4 | 0 | 8 | 11 | 23 | 0,0 | 17,4 | 0,0 | 34,8 | 47,8 |
| Natufian  | Shubaiqa 6  | CM0023 Sh6  | 0 | 12 | 0 | 8 | 9 | 29 | 0,0 | 41,4 | 0,0 | 27,6 | 31,0 |
|  |  |  |  |  |  |  |  | Mean | 0 | 28,6 | 0 | 38,9 | 32,5 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| PPNA  | Shubaiqa 6  | CM008 Sh6 A-1A  | 0 | 8 | 0 | 1 | 3 | 12 | 0,0 | 66,7 | 0,0 | 8,3 | 25,0 |
| PPNA  | Shubaiqa 6  | CM015 Sh6 A-1A  | 6 | 14 | 0 | 5 | 1 | 26 | 23,1 | 53,8 | 0,0 | 19,2 | 3,8 |
| PPNA  | Shubaiqa 6  | CM017 Sh6 A-1A  | 0 | 4 | 0 | 5 | 6 | 15 | 0,0 | 26,7 | 0,0 | 33,3 | 40,0 |
| PPNA  | Shubaiqa 6  | CM079 Sh6 A-1A  | 5 | 6 | 0 | 10 | 1 | 22 | 22,7 | 27,3 | 0,0 | 45,5 | 4,5 |
|  |  |  |  |  |  |  |  | Mean | 11,4 | 43,6 | 0,0 | 26,6 | 18,3 |

**Table 7.** Classification of 3D samples of gloss by texture analysis in tools recovered in archaeological sites/levels of Southern Levant.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Ripe | Semi-ripe | Unripe | Reeds | Grass |
| Hayonim Terrace Natufian | 11,9 | 13,1 | 36,0 | 34,5 | 4,6 |
| Shubayqa 1 and 6 Natufian | 0 | 28,6 | 0 | 38,9 | 32,5 |
| Shubayqa 6 EPPNA | 11,4 | 43,6 | 0,0 | 26,6 | 18,3 |
| Kharaysin PPNA | 19,4 | 44,4 | 0,0 | 27,8 | 8,3 |
| TQN EPPNB | 60,0 | 19,5 | 15,4 | 4,2 | 0,9 |
| Kharaysin EPPNB | 75,9 | 7,1 | 12,6 | 4,4 | 0,0 |
| Kharaysin MPPNB | 78,5 | 19,6 | 1,3 | 0,7 | 0,0 |
| Nahal Hemar MPPNB | 74,1 | 14,8 | 0,0 | 11,1 | 0,0 |
| Ba'ja LPPNB | 37,5 | 56,3 | 2,1 | 4,2 | 0,0 |

**Table 8.** Classification of 3D samples of gloss by texture analysis in tools recovered in archaeological sites/levels of Northern Levant.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Ripe | Semi-ripe | Unripe | Reeds | Grass |
| AH/Mb Natufian | 13,1 | 51,2 | 22,2 | 10,4 | 3,0 |
| Mureybet PPNA | 29,6 | 36,3 | 20,6 | 12,4 | 1,2 |
| Jerf PPNA | 45,1 | 32,3 | 20,0 | 2,3 | 0,3 |
| Mureybet EPPNB | 36,9 | 42,7 | 13,9 | 3,4 | 3,1 |
| Dja'de EPPNB | 26,6 | 37,8 | 2,4 | 17,0 | 16,1 |
| Abu Hureyra MPPNB | 31,6 | 66,7 | 0,0 | 1,8 | 0,0 |
| Halula MPPNB | 50,3 | 29,2 | 12,6 | 7,3 | 0,7 |
| Halula LPPNB | 48,8 | 41,2 | 5,5 | 4,5 | 0,0 |

**Table 9.** Index of the degree of maturity of cereals harvested with lithic tools based on texture analysis of gloss in sites of Northern Levant.

|  |  |  |
| --- | --- | --- |
| Period | Site | Index |
| LPPNB  | Tell Halula  | 155 |
| MPPNB  | Tell Halula  | 160 |
| MPPNB | Abu Hureyra  | 168 |
| EPPNB  | Dja'de  | 164 |
| EPPNB  | Tell Mureybet  | 175 |
| LPPNA  | Jerf el Ahmar  | 174 |
| PPNA  | Tell Mureybet  | 190 |
| Natufian  | Abu Hureyra  | 210 |

**Table 10.** Index of the degree of maturity of cereals harvested with lithic tools based on texture analysis of gloss in sites of Southern Levant.

|  |  |  |
| --- | --- | --- |
| Period | Site | Index |
| MPPNB  | Kharaysin  | 122 |
| EPPNB  | Kharaysin  | 134 |
| EPPNB  | Tell Qarassa Norte  | 152 |
| PPNA  | Kharaysin  | 170 |
| PPNA  | Shubayqa 6  | 179 |
| Natufian  | Shubayqa 1/6  | 200 |
| Natufian  | Hayonim Terrace  | 239 |

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