



Universiteit  
Leiden  
The Netherlands

## **Early Bronze Age settlement system and village life in the Jenin Region/ Palestine : a study of Tell Jenin stratigraphy and pottery traditions**

Salem, H.J.

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## CHAPTER 4

# A TECHNOLOGICAL STUDY OF THE EARLY BRONZE AGE I POTTERY OF TELL JENIN

### 1 INTRODUCTION

This chapter presents the results of a technological study of the EBI pottery from Tell Jenin. The pottery material was recovered from Site 3 and Site 4. The technological study of the pottery from Tell Jenin is significant to fulfil the following objectives.

- 1) As seen in the previous chapters, Tell Jenin is among the few EBI excavated settlements in the region south of Marj Ibn 'Amir. Hopefully, this study of the pottery will contribute to the understanding of the EBI pottery traditions.
- 2) Technological studies of the EBI pottery traditions are rare. There is almost no detailed technological study (especially of potmaking methods) from Palestinian sites. The few investigations of the pottery that focused on the technological analysis are based on a brief presentation of the fabric groups (Ein Shadud, Kabri, Arad ...etc).

In Jordan, for example, the study of Bab edh-Dhra includes a detailed analysis of the complete forms (Schaub and Rast 1989, 2000). However, the bulk of information on the clay and technology is marginal. One exclusion is the attempt by London who briefly reports aspects of Early Bronze Age pottery from Tell el- U'meiri (London 1991a).

- 3) Although the method of analyzing the complete forms is a very important step, the method is very limited when dealing with sherd materials. The complete forms are recovered mainly from tombs, while the sherd remains are recovered from habitation sites. The latter are the common pottery materials found in most Palestinian sites. A quantitative-technological typology of the pottery sherds is developing an

alternative approach to presenting only complete forms.

Interest in a refined typology is the core of many pottery presentations (Franken 1995, Franken and Steiner 1990, Schaub and Rast 1989, 2000, London 1991a). The pottery typology of Tell Jenin is a significant contribution to this objective because it was recovered from a well-documented micro-stratigraphy. The method followed in this research is that after the analysis of the site stratigraphy, pottery is analysed as part of the stratigraphic contents. Since the micro-stratigraphy controls the time sequence of the site, it becomes a measure for defining the change of pottery types. As suggested below, the pottery *type* is a product of a detailed analysis of a set of attributes that represents technological aspects, forms and surface treatments and finishing.

Therefore, this study aims at producing a refined typology of the EBI pottery traditions by focusing only on Tell Jenin. The study is a quantitative and qualitative analysis of the technological traits of a carefully selected sample. The quantitative/qualitative development (or continuity and change) of each type is presented in a specified chronological level. The end of this analysis is to identify the dominant types from the less dominant ones during the EBI.

### 2 MATERIALS AND METHODS

#### 2.1 NATURE OF THE STUDY SAMPLE

Around 10,000 Early Bronze Age I sherds were collected from non-contaminated loci, all

from the EBI strata. First, eleven complete or half-complete forms were mended and many sherds were glued together. Next, a study sample was selected on the following basis: (1) all complete or partially complete forms, (2) all diagnostic sherds were selected (fragments of rims, handles, shoulders, spouts, bases), (3) large body sherds and body sherds with decoration or surface finishing, such as, incision, painting, polishing or slip coating. The remaining body sherds were not included in the typological analysis.

The final number processed by statistical analysis was 3,819 sherds. This figure includes also the complete or the half-complete forms.

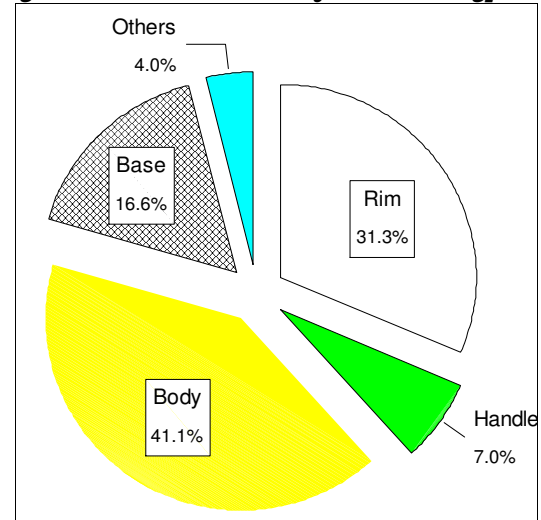
Table 3.1.1 and Figure 4.1.1 summarise the distribution of all sherds. It shows that more than half the collection (59%) consists of diagnostic sherds (rims, bases, handles or others), while the body sherds form 41% of the collection. More than one third are rims (31%). This distribution provides a well representative study sample.

Moreover, Table 3.1.1 and Figure 4.1.2 summarise the sherd distribution between the two strata and the table shows that 1,900 sherds come from Stratum III, and the other half (1,919 sherds) comes from Stratum IV. The diagnostic sherds distribution between the two strata do not fall within the same variety. They are distributed in a more representative way in Stratum IV. Meanwhile, sixty-three percent of the body sherds are found in Stratum III, which represents more than half the collection for this stratum.

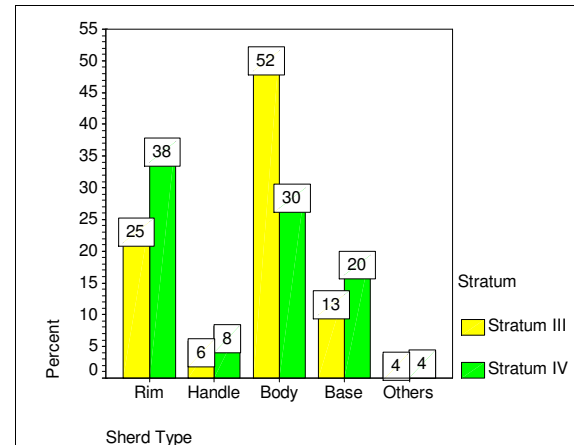
**Table 3.1.1: Distribution of Sherd Types Between the Two Strata**

		<b>Rim</b>	<b>Hand.</b>	<b>Body</b>	<b>Base</b>	<b>Others</b>	<b>Total</b>
<b>Stratum III</b>	<b>Count</b>	474	112	986	256	72	<b>1900</b>
	<b>Row%</b>	25	6	52	14	4	<b>50</b>
	<b>Column%</b>	40	42	63	40	47	
	<b>Total%</b>	12	3	26	7	2	
<b>Stratum IV</b>	<b>Count</b>	722	155	582	379	81	<b>1919</b>
	<b>Row%</b>	38	8	30	20	4	<b>50</b>
	<b>Column%</b>	60	58	37	60	53	
	<b>Total%</b>	19	4	15	10	2	
<b>Total</b>	<b>Total Count</b>	1196	267	1568	635	153	<b>3819</b>
	<b>Total%</b>	31	7	41	17	4	

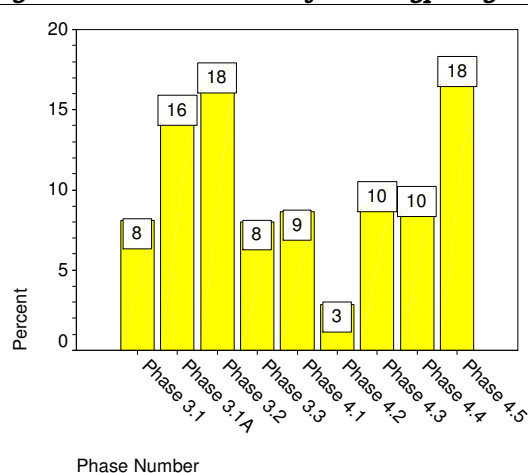
**Figure 4.1.1: Distribution of the Sherd Types**



**Figure 4.1.2: Distribution of the Sherds between the two Strata**



Furthermore, the distribution of the sherds within the stratigraphic units had another significant meaning (Figure 4.1.3). If each rim represents one pot, then 43% of the sherds came from primary refuse contexts (or occupational phases like surfaces and walls (Phases 3.1, 3.1a, 4.1 and 4.3). The rest were recovered from secondary refuse contexts (or destruction and abandonment phases like erosion layers and wall falls (Phases 3.2, 3.3, 4.2, 4.4, and 4.5). This distribution creates an advantageous situation for the analysis because the amount of sherds, which were dumped or moved from their original place of use, is about the same as those that were deposited on the place of use (In Schiffer's terminology this is *primary refuse* and *secondary refuse* Schiffer 1983, 1987).

**Figure 4.1.3: Distribution of Sherd types by Phase**

Furthermore, to eliminate any bias resulting from the way the sherds accumulated, the entire sherd population of a single stratum is treated as a homogeneous sample. At the end, the remains from all the phases within each stratum supposedly belong to the same stratigraphic sequence. Thus, the following is a presentation of the EBI pottery type variations and similarities of the two strata. Reference to a particular phase context is made when necessary.

In addition, to eliminate any bias when dealing with the pottery data, only the complete forms and the rim sherds were used to define the typology. However, all the sherds were examined to give a general picture of the EBI pottery of Tell Jenin.

## 2.2 METHODS OF DATA COLLECTION AND ANALYSIS

### 2.2.1 Data Collection

In doing a quantitative typology of the EBI pottery, each sherd was labelled with a unique number. It was then registered into a data form identified by this number. Some students' help was obtained in entering data into the form. In specific, they assisted in measuring the diameters, thickness, and colour according to the Munsell Soil Colour Charts (MSCC). I completed the rest of the data.

### 2.2.2 Analysis

The technological ceramic research includes

the investigation of (1) The raw materials, (2) manufacturing techniques, (3) pottery forms, and (4) the surface treatment and decoration.

#### 2.2.2.1 RAW MATERIALS

The study of the raw materials includes: (1) the investigation of the clay resources in the vicinity of Tell Jenin (assuming that the majority of the Jenin pottery may have been made from local clay resources found in the site vicinity), to be compared with the results of (2) research into the excavated pottery (especially the inclusions and tempering agents within the clay matrix) (See articles for the *Newsletter of the Department of Pottery Technology (Leiden University)* 11/12, 1993/94: 9-10).

##### 2.2.2.1.1 Study of the Clay Samples

The investigation and analysis of the clay resources follow Rye (1981:12-13) and the Leiden approach to pottery technology (van As 1984, 1992, 1995, 2004, van As et al. 1995, Loney 2000). The specific objective of this approach is to investigate the clay types and mineralogy of the Tell Jenin zone. Eleven clay samples were collected during a clay survey of the site surroundings. Another sample was collected from a distance because of its distinctive red calcite mixture, which is probably similar to a tempering agent used in the EBI.

All clay samples were tested for plasticity and workability. Plasticity is the “*property of a water-clay mixture that allows it to be pressed into a shape without returning to its original form when pressure is released*” (Shepard 1980: 14). Various sources stated the relation between plasticity and workability (Shepard 1980: 15, Rice 1987: 62). Therefore, certain conclusions can be reached regarding plasticity by testing workability. The following is a summary of the methods and results of these tests.

First, the clay samples were prepared. About 750-1000 grams of clay were soaked in water leaving it to settle and then it was kneaded. Next just as much water was subtracted from or added to the clay, as to bring it in an optimal condition for working. Substantial testbars were made

from the resulting paste. The aim was to give a judgement on the workability properties, which are closely related to plasticity. This was done by executing a number of what is called '*workability tests*' (Mr. Loe Jacobs o.c.) These tests were conducted at the Department of Pottery Technology (Leiden University) with the help of Mr. Loe Jacobs. The tests include: the estimation of the weight loss, the making of testbars, the measuring of the linear shrinkage, a snap test to measure the strength of the fired clay and measuring the clay porosity.

*The Weight Loss Test:* The objective of this test is to compare the plasticity of different clay samples. It is based on measuring and comparing the water loss of clay. Weight loss is the difference between the dry weight and the wet weight of a known clay body (100 grams). "*In effect, this calculation bases the measure of plasticity on the amount of water lost from the clay in drying*" (Rice 1987: 62). The more the water loss, the higher is the clays plasticity (Jacobs and van As: o.c).

*The making of testbars:* This implies that the clay was kneaded and formed into coils. Next the coils were pressed and shaped into testbars. This way the making of testbars or briquettes gives a first indication about the clays workability. Too short clays for instance don't allow coiling.

*The Linear Shrinkage Test:* The clay shrinkage is a strong indication of the clays plasticity and its contents (Jacobs 1983, Rice 1987: 88-9). This test is based on obtaining the clays shrinkage by measuring the decrease of a known distance marked on clay briquettes (testbars).

Besides the drying shrinkage, estimated when the testbars were in a bone dry condition, each briquette was fired and the total shrinkage was measured at 50 °C intervals. The more is the shrinkage, the more plastic is the clay (Jacobs 1983: 9).

*The Snap Test:* The clay strength is another indication of the degree of plasticity (Rice 1987: 358-362). Generally highly plastic clays are

stronger than short clays. The snap or green strength test is a measure of the clays ability to hold weight (the method is similar to the *tensile strength* developed by Grimshaw in Rice 1987: 358).

*The Porosity Test:* The clay porosity is a good measure of the similarity and differences of various clay contents, compositions and kneading. Many factors have an impact on porosity (Shepard 1980: 125-30, Rice 1987 350-354). "*Among the factor influencing porosity are the size, shape, grading, and packing of particles, the specific constituents of the clay-body mix and the treatment to which the material was subjected during manufacture*" (Rice 1987: 351). Firing causes changes in clay porosity (Shepard 1980: 126). Apparent porosity may decrease with the rise of temperature (Rye 1981: 121-122). It can be calculated by measuring water absorption. The porosity test measures the difference between the dry weight and the wet weight of ceramic briquettes fired at various temperatures (weight loss). The apparent porosity rate is calculated according to the following formula (see Shepard 1980: 127, Rice 1987: 62):

$$(wet\ weight - dry\ weight) / dry\ weight \times 100 = \\ apparent\ porosity$$

The porosity test is the only test of this series, which is done on the clay after firing, this is to say on the ceramic material. Therefore the porosity test, in fact is not a real workability test. To be specific, it is a material test. However, because its result is closely related to certain aspects of the clays workability, it was incorporated with the other tests. Aspects like plasticity (through particle size) and coherence of the clay mass can be interpreted.

Roughly indicated, the relation is that when clay particle size is large, as with short clays, plasticity tends to be low. Short clays are low in plasticity and cannot contain very much water before getting saturated. Thus their water content (water of plasticity) is relatively low and so is drying shrinkage. Because the large clay particles do not pack very close

when dry, the dry structure is a relatively open one and therefore porosity after firing is high. (This is when nothing is added or subtracted from the natural clay). When clay particle size is very small, plasticity is high. At the same time the water content (water of plasticity) is also high. As a result drying shrinkage will be much. The dry structure of the fabric will be dense, due to close packing of the small particles. After firing the result is a very compact and dense fabric, low in porosity. (Again when nothing is added to, or subtracted from the natural clay).

Besides these tests, the clay sample colour was measured before and after firing. The colour of the clay after firing gives an indication of the contents and clay composition (Shepard 1980: 103, Rye 1981: 119, and Rice 1987: 343-345).

Furthermore, the non-plastic inclusions were investigated through both macroscopic analysis (see Section 2.2.2.1.2) and petrographic analysis. About 54 thin sections were made, based on random selection. The results of all these investigations are summarised in Section 3.1.

#### 2.2.2.1.2 Study of the Pottery

The fabric colour -as a factor of atmosphere, temperature and duration of fire- was measured using *MSCC* for all the registered sherds.

The clay texture was analysed by observing the voids and its appearance in a fresh break section of the sherd. Relatively, the appearance was coded into four categories: *very fine texture*, *fine texture*, *medium fine texture*, and *coarse texture*.

The clay fabric, i.e. the inclusions and tempering agents within the clay matrix, was investigated by (1) an eyeball macroscopic analysis, and (2) a petrographic analysis done by Tahani Ali at the Palestinian Institute of Archaeology of Birzeit University.

However, only the rim sherds were examined. This selection was done to avoid any statistical bias created in case two sherds from the same

vessel are examined, i.e. if other sherds than the rims belonged to the same vessel. It also assumes that each rim represents a single pot.

The macroscopic analysis of the non-plastics was applied by examining a newly cut section under a 10X -20 X microscope. This method is similar to the one adopted by the *Department of Pottery Technology (Leiden University)*, and it was done through an intensive training by Dr. Bram van As and Mr. Loe Jacobs. The idea beyond this method is "*to discover what the sherds have in common and which features go together*" (Franken and Steiner 1991: 77). The sherds were carefully chopped to provide a fresh break. The chip was glued into a strong paperboard next to its serial number. The size of each chip did not exceed one square centimetre but also not less than half a centimetre to allow sufficient exposure under the microscope.

Three non-plastics aspects were measured: (1) *type*, (2) *size*, and (3) *intensity*.

The *crystalline shapes*, *colour*, and *hardness of the grits* identify the type. Only the most dominant types were selected in the quantitative clustering, which by turn reduced the variability and data redundancy.

If the sample included a rare element like basalt, flint, or microfossils, then it is used as the main attribute, even if it was not the dominant one. It was done under the assumption that rare elements may better define the fabric group.

The *size* indicates the techniques of manufacturing in relation to a pot wall thickness and surface treatment (Rye 1981: 27, 61). It may also indicate whether the non-plastics are added to or originally included in the clay (Shepard 1980: 161-162). Traditional Palestinian potters tend to sieve and levigate their clays before using it, a process which removes the larger particles. If larger particles are found, then it is possible that the potters used a sedimentary clay type being hard to clean completely.

The average of all the sizes together was recorded in millimetres.

Rye (1981: 39) indicates that *intensity* is related to clay plasticity and workability. He suggests that a high percentage (20-50%) is the normal ratio. Very plastic clay needs up to 80% non-plastics. The intensity is measured according to the non-plastics percentage in one centimetre area representing the fabric matrix. A reference collection, prepared by Mr. L. Jacobs, was used to check these percentages.

In some cases, the non-plastics shape was studied. It was noted in terms of the roundness (round, sub rounded and angular) (Cf. Stienstra 1986: 42). However, it was observed that some types like lime and calcite always come with the same shape. Therefore, it was irrelevant to include the shape of the non-plastics, a factor that minimises statistical variability.

#### 2.2.2.2 MANUFACTURING TECHNIQUES

Where possible, the three manufacturing method aspects were obtained: *Clay preparation*, *forming techniques*, and *firing*. All three aspects were investigated through the analysis of the traces left on the pottery. The analysis of the clay preparation is predicted by examining the voids and the added non-plastics (especially tempering agents). Many large voids indicate less kneading, contrary to the case in the absence of voids. The addition of the non-plastics to the clay indicates the need to improve its workability (see above).

The forming technique was obtained by analysing the fingertips marks and the regularity and thickness of the walls (See Rye 1981, Salem 1986). Often fine continuous regular groove lines on the walls indicate the wheel marks. A thin layer of slurry is also associated with these markings. It should be distinguished from irregular thick lines resulting from finishing the pot by hand. In general, forms finished on the wheel have regular wall thickness and an even non-plastics orientation.

Coiling is evident by the non-plastics random orientation and irregular wall thickness. Roughly, a thick wall means also coiled pottery, since it is difficult to add a new coil to a thin

wall, which dries out quickly and will collapse when other coils were added. The coils are also evident by the remains of a fracture causing a double wall result from joining two coils when one is dry (Rye 1981: 68).

A detailed analysis of the forming technique was obtained from the complete forms. With sherds, a reference to the general manufacturing methods was made- namely *wheel* and *coiling* techniques.

The firing techniques were rated as *low fired*, *medium fired* and *high fired*. The sherd core is a distinctive zone in the cross section, which indicates the “*atmosphere and temperature of firing*” (Rye 1981: 115). The colour and orientation of the core is the basis for this estimate (i.e. the core thickness and its location in the section) (See Rye 1981: 114-118). A grey thick core indicates that carbon was not completely oxidised, a case which is common to the low fired pots. On the other hand, a pot without a grey core and a cross section of uniform colour indicates that it was highly fired. Many sherds showed yellow or red cores indicating a complete firing.

#### 2.2.2.3 POTTERY FORMS

The pottery form is the final product of a potter. Only complete pots define the pot form. We can distinguish open and closed forms. If the rim diameter is smaller or equal to the base diameter, then the form is closed. If the rim diameter is larger than the base diameter, then the form is open. In addition, the categories jars, cooking pots, jugs, bowls, cups and plates were used to define the vessel form. The height, circumference, wall thickness, and rim and base diameters of all the complete forms, were measured.

Moreover, the sherds were divided into *rim*s, *handles*, *bases*, *shoulders*, *bodies*, *spouts*, or *others*.

Rim shapes were coded as *round*, *pointed*, *grooved*, *flat*, and *ridged*. Handle shapes were coded as *ledge*, *loop*, *knob*, *lug*, or *others*. Base

shapes were coded as *flat*, *rounded*, *concave* or *others*.

In addition, the rim turns and handle sections were recorded. The rim turn was coded into three categories, out turned, in turned or straight. The handle section was coded as *round*, *oval* and *pointed*.

Finally, the wall thickness of all sherds and rim and base fragments diameters were measured.

#### 2.2.2.4 SURFACE TREATMENT AND DECORATION

Four decoration attributes were recorded where applicable: *Type*, *location*, *colour* and *shape*. The type attribute was coded as *slip*, *polish*, *smooth*, *paint*, *burnish*, *incision*, or *rope*. The decorative features location was coded as *inside*, *outside*, *both*, or *lines below the rim* or at the shoulder. The paint colour was also noted. The shape attributes were described in terms of a specific type (For example incision includes *notches*, *lines*, *dots*, *finger indentation*, *punching*, etc).

#### 2.2.3 STATISTICAL ANALYSIS

After completing the database for each coded sherd or complete form, all the data were quantitatively processed using SPSS software. This step was followed to enable quantifying the form attributes, to compare each trait with one another and to indicate the quantitative-qualitative variations of each type during the EBI phases. This method is of help to identify the dominant types from the least dominant one and to indicate which types originated chiefly in the early phases and which start disappearing toward the later phases.

Furthermore, statistical analysis was done to cluster the types by a means of component analysis. The most distinguishing variables for component analysis were surface treatment, non-plastics, diameter and form. This method allowed: (1) The relation within each type, where it is assumed that a group of sherds that are clustered near each other may be made by a single workshop, (2) Similarly, the relationship

between the groups is a measure of the variations in workshops; the case is that each distant cluster suggests that the pottery may have been made by a different workshop.

### 3 RESULTS

#### 3.1 RAW MATERIALS

##### 3.1.1 The Natural Clay (Clay Samples)

Eleven clay samples (J1-J11) were collected from three locations. Five samples (J1-J5) were collected from Karem Jenin Mountain, from the area east of the Tell until the southern fringe. The distance between the Tell and the location of samples J1 to J4 is about one kilometre. The distance between the Tell and the location of sample J5 is about 2.5 kilometres. All the five samples, except sample J2, are of the typical Terra Rosa (*Hamra*) clay, which is rich in hematite. Franken (o.c.) proposed that this clay was used for making the cooking pot. It is commonly used today in making bread ovens (or *twabeen*). The potter of Jaba' mixed the same clay with lime clay types. Sample J2 was collected from the top of limestone rocks of newly formed soil. It is a good source for the lime clay of the region.

Four samples (J6 to J9) were collected from the Wadi Izz Eddin area. The wadi is located within the range of two kilometres east of the Tell. Samples J6 and J7 are of the typical wadi washed materials. They were mixed with large gravel particles. Samples J8 and J9 were taken from a newly formed soil inside a cut rock. The rock profile is 15 meters high. Sample J8 was collected from an erosion layer on top of the same rock profile. Sample J9 was a large bucket of soil within this limestone rock.

The remaining two samples (J10-J11) were taken from the Marj Ibn 'Amir wadi fan. Sample J10 was taken from a meter deep pit of a newly cut house foundation. Sample J11 was taken from a deep section at the bank of the river Muqata'a. The area had a fresh cut by the water stream. It belongs to the Wadi forming typical sedimentary clay.



## 3.1.1.1 COLOURS

The clay colours varied according to the specific geographic location of the samples (Table 3.2.1). The dominant colours of the unfired clays are the reddish brown colours (5YR 4/4 reddish brown or 7.5 YR 4/4 strong brown) as is the case of samples J1, J4, J5, J7, J8, J9. Yellow clay with a tendency to greenish (2.5 Y 4/4 olive brown or to a greyish colour 2.5 Y 7/2)

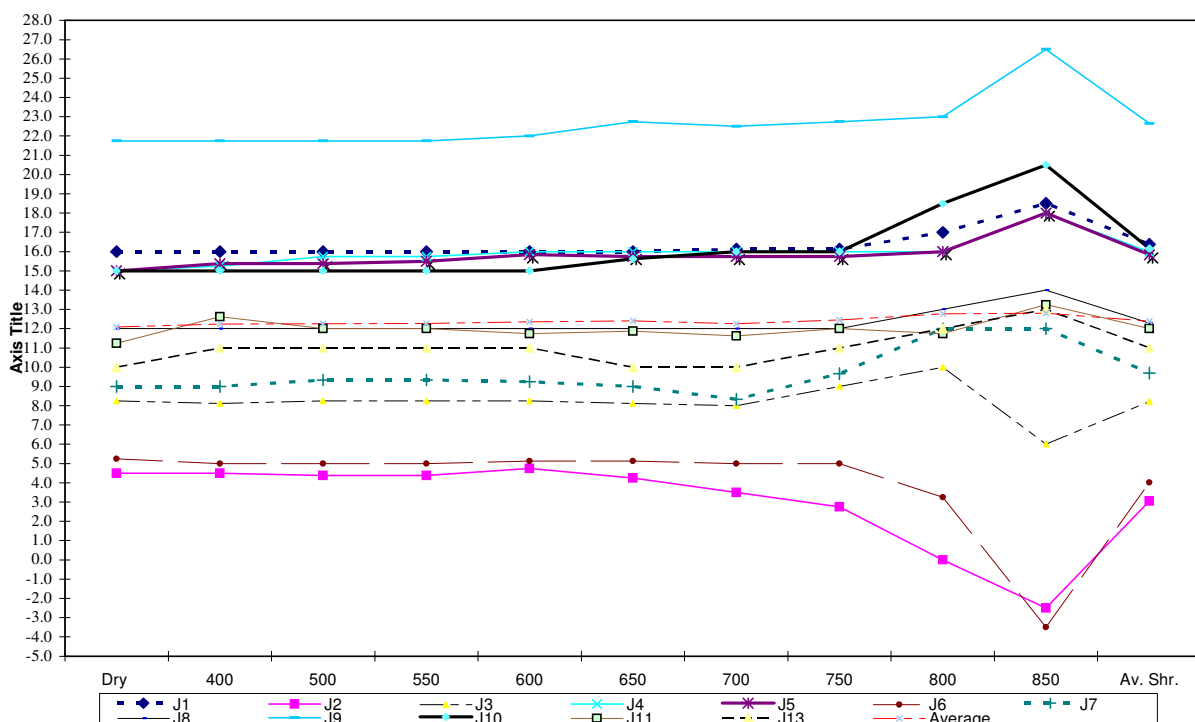
is also found in the region.

The clay samples which were collected from Marj Ibn 'Amir had darker hue colours but also with a tendency to greyish colours (J10, J11). Those samples, which were recovered from the top of Karem Jenin Mountain and from the Wadi Izz Eddin upper layers, are reddish in colour. The samples from the wadi wash (J 6, J7, and J8) had yellow colours.

**Table 3.2.1: Colours of Clay Samples**

	Number	Colours	
	Dry Colour	Colour at 500	Colour at 700
<b>J1</b>	5yr 4/3 Reddish brown	5yr 5/6 Yellowish Red	5 YR 6/6 Yellowish Red
<b>J2</b>	2.5 Y 7/2 Light grey		7.5 YR 8/4
<b>J3</b>	2.5 Y 5/4 Light Olive brown	10yr 7/4 Very Pale brown	10yr 7/4 Very Pale brown
<b>J4</b>	5yr 4/4 reddish brown	2.5 YR 4/6 Dark Red	2.5 YR 4/6 Dark Red
<b>J5</b>	5yr 4/4 reddish brown	2.5 YR 4/6 Dark Red	2.5 YR 4/6 Dark Red
<b>J6</b>	10y 6/4 Lt. Yellowish Brown	10YR 7/4 Very Pale Brown	7.5 YR 7/6 Reddish Yellow
<b>J7</b>	7.5 YR 4/6 Strong Brown	7.5 YR 5/6 Strong Brown	5 YR 7/6 Reddish Yellow
<b>J8</b>	7.5 YR 4/4 brown	7.5 YR 5/6 Strong Brown	7.5 YR 6/6 Reddish Yellow
<b>J9</b>	5 YR 4/4 Reddish brown	2.5 YR 4/6 Dark Red	2.5 YR 4/6 Dark Red
<b>J10</b>	10 YR 4/2 dark greyish brown	10YR 6/4 Light Yellowish Brown	7.5 YR 6/6 Reddish Yellow
<b>J11</b>	2.5 Y 4/4 Olive Brown	7.5 YR 5/6 Strong Brown	5 YR 6/6 Reddish Yellow
<b>J13</b>	5 Y 7/4 Pale Yellow		

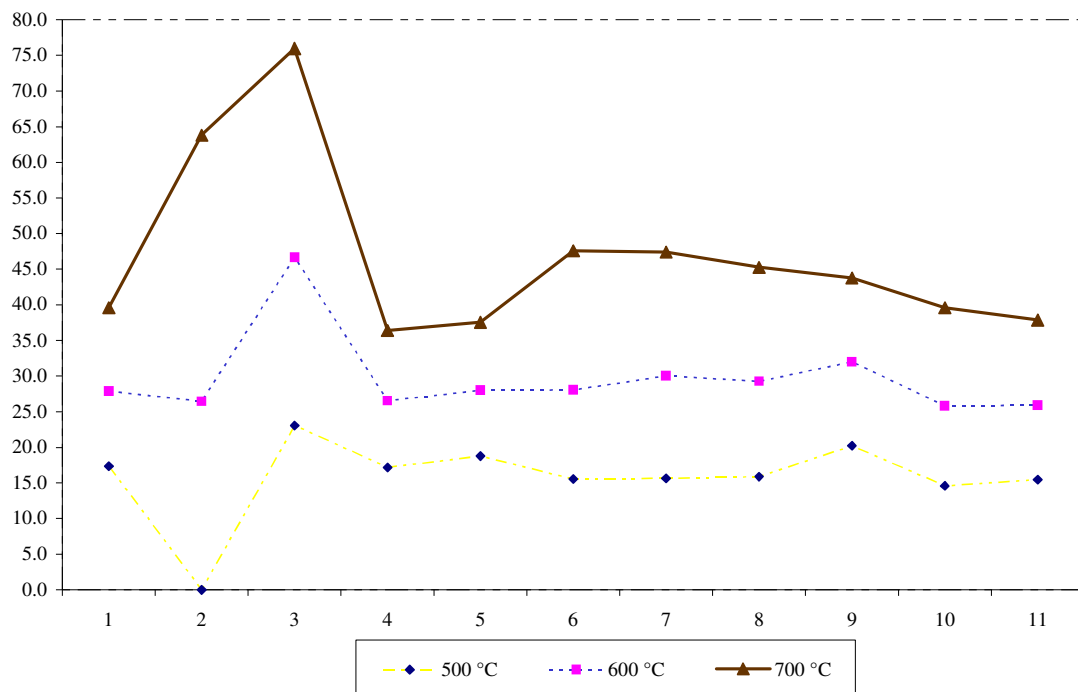
**Figure 4.2.1: Shrinkage Rate of all Samples**



After being fired at 700 °C, all the samples changed colours, except in one case. Most clays turn to reddish yellow and those that had the

darker colours, retained the reddish colours (see Table 3.2.1). Samples J 4, J5, and J9 of reddish colours turned to dark red, which is another

**Figure 4.2.2: Average Porosity Rate of all Samples at Various Temperatures**



**Table 3.2.2: Strength, Porosity and Shrinkage Rates of Jenin Clay Samples**

No.	Shrinkage											Porosity					Strength
	Dry	400	500	550	600	650	700	750	800	850	Av.	500	600	700	800	Av.	
J1	16.0	16.0	16.0	16.0	16.0	16.0	16.1		17.0	18.5	16.4	17.3	10.5	11.7		13.2	5.8
J2	4.5	4.5	4.4	4.4	4.8	4.3	3.5	2.8	0.0	-2.5	3.1	0.0	26.5	37.4		21.3	10.0
J3	8.3	8.1	8.3	8.3	8.3	8.1	8.0	9.0	10.0	6.0	8.2	23.1	23.6	29.3		25.3	10.2
J4	15.0	15.3	15.8	15.8	16.0	16.0	16.0	16.0	16.0	18.0	16.0	17.2	9.4	9.9	11.8	12.1	11.0
J5	15.0	15.4	15.4	15.5	15.8	15.8	15.8	15.8	16.0	18.0	15.8	18.8	9.2	9.6	11.8	12.3	12.3
J6	5.3	5.0	5.0	5.0	5.1	5.1	5.0	5.0	3.3	-3.5	4.0	15.5	12.5	19.5		15.9	22.0
J7	9.0	9.0	9.3	9.3	9.3	9.0	8.3	9.7	12.0	12.0	9.7	15.6	14.4	17.4		15.8	
J8	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	13.0	14.0	12.3	15.9	13.4	16.0		15.1	5.3
J9	21.8	21.8	21.8	21.8	22.0	22.8	22.5	22.8	23.0	26.5	22.7	20.2	11.8	11.8	14.0	14.5	5.3
J10	15.0	15.0	15.0	15.0	15.0	15.6	16.0	16.0	18.5	20.5	16.2	14.6	11.2	13.8	9.9	12.4	14.5
J11	11.3	12.6	12.0	12.0	11.8	11.9	11.6	12.0	11.8	13.3	12.0	15.5	10.4	11.9	14.3	13.0	16.7
J13	10.0	11.0	11.0	11.0	11.0	10.0	10.0	11.0	12.0	13.0	11.0						5.7
Average	12.1	12.2	12.3	12.3	12.4	12.4	12.3	12.5	12.8	12.8	12.4	14.5	13.9	17.1	14.5	16.0	10.7

indication that the clay is rich of hematite. Comparing these colours to the fired clay of the EBI pottery indicates that it is the dominant fired clay.

### 3.1.1.2 SHRINKAGE RATE

Table 3.2.2 (Figure 4.2.1.) shows the average shrinkage rate for all the clay samples at different temperatures. Sample J9 had the highest shrinkage rate among all other samples, with an average shrinkage of 23% and dry shrinkage rate of 22%. The high shrinkage rate had to do with the fact that it is (1) highly plastic clay and (2) it includes no grits among its contents. J9 was 10% higher than the average shrinkage rate of all the clay samples. The bars however expanded at 850 °C.

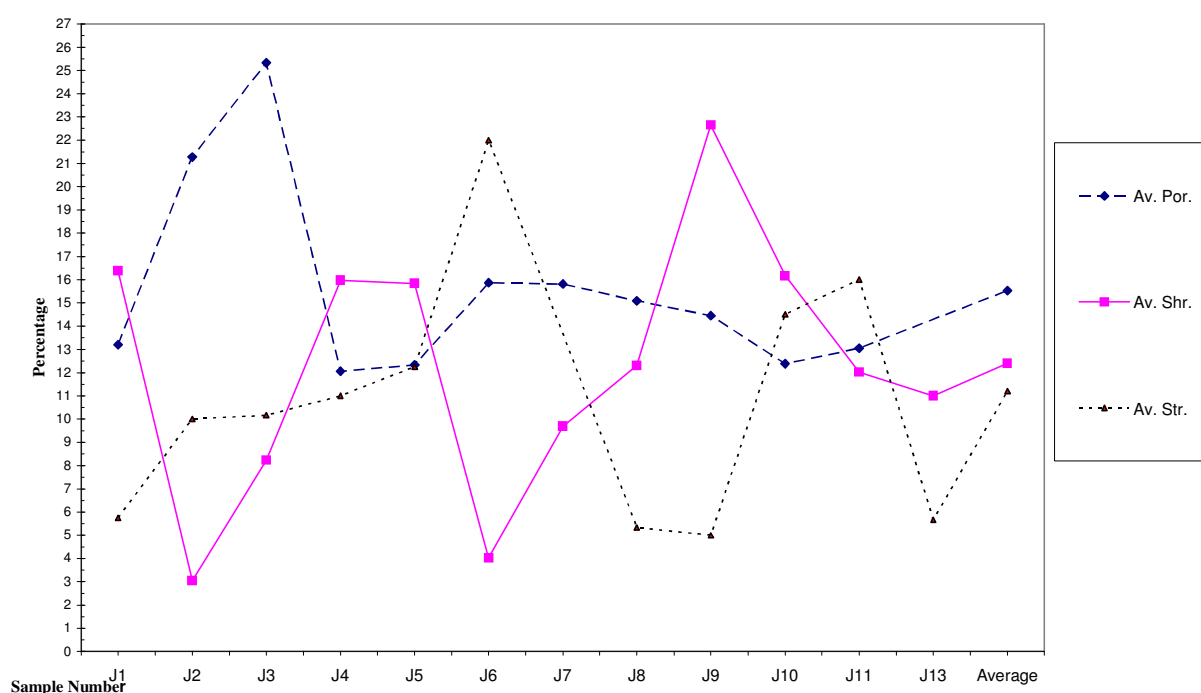
Noticeably, most of the samples had expanded at this temperature. Contrary to that, Samples J6 (and J2) expanded 3.5% at 800 °C. Expansion starts to expand when fired to 550 °C. While the case was expected for sample J2 because it was scratched from the top soil of a limestone rock, the case for sample J6 was that it included a lot of lime in its contents, a typical ingredient of the region's residual clay.

Sample J7 had a stable shrinkage rate until 650 °C when the shrinkage rate fell but it started to go up again when fired to 750 °C. Sample J3 had a stable shrinkage rate, and the lowest, for the shrinkage rate increased at 600 °C, but again it started falling sharply at 650 °C. Samples J4, J5, J8, J10, and J11 had similar shrinkage behaviour. All had a gradual increase of shrinkage and ended with the highest shrinkage rate. Sample J11 increased 2% at 450 °C, and then was irregular until 800 °C when it started coming up again. The clay shrinkage tests proved that there is a relation between plasticity and inclusions. The inclusions reduce the shrinkage rate and improve the clay drying.

### 3.1.1.3 POROSITY

The average porosity rate of all the samples is 16%. The rate decreased at 600°C for all the samples and increased again at 700 °C (Table 3.2.2, Figure 4.2.2). Samples J2 and J3 had the highest porosity rate. They came from the same geological formation. It is also because they had more grits in their contents. If we exclude these two samples, then the remaining clay samples will have a similar porosity rate, with a minor deviation.

**Figure 4.2.3: Chart of Average Strength, Porosity, and Shrinkage Rate for Clay Samples**



However, samples J4 and J5 had a lower porosity rate when fired at 600 °C and 700 °C. At 800 °C, the porosity rate increased very little. The reason is that they are of very plastic clays and include few grits within their contents.

#### 3.1.1.4 STRENGTH

This test was not conducted with sample J7 because the clay amount was not sufficient. The average strength for all the samples was 11 (See Table 3.2.2., Figure 4.2.3). This average is still below the average strength rate of the clay used today by the traditional potters (17%). Only sample J 6 is the closest to this average, which supports the proposition that the clay formed by the wadi (samples J6 and J10 and J11) are stronger than the clays formed in the mountains. The clay samples, which were highly plastic, were less strong. Samples J2, J3, J4, and J5 fall within the average strength of the clay that originated on top of the mountain areas.

However, the strength test proved that the relation between clay plasticity and the strength is a result of the clay components. The potters had realized that tempering the clay of Jenin is a necessary step to making pottery. It is one reason why nearby Jaba' traditional potters followed the tradition of mixing different clay types in their attempt to increase the clay plasticity.

#### 3.1.1.5 THE NON-PLASTICS

Most of the samples included lime impurities

**Table 3.2.3: Non-plastics Type Size, and Intensity for Clay Samples**

Sample Number	Inclusions		
	Type	Size mms	Intensity. %
J1	Lime	2-15	15
J2	Lime	2-15	25
J3	Lime	2-30	35
J4	Lime	5-30	10
J5	Lime	2-25	10
J6	Lime of W. St., shell	2-20	30
J7	Lime, Hematite, shell	2-30	30
J8	Lime	2-15	35
J9	Chalk, Calcite	2-10	5
J10	Lime of W. St., shell	2-10	25
J11	Lime of W. St.	2-20	20
J13	Red Calcite	2-10	30

in their contents. The non-plastics intensity range falls between 5- 35% (Table 3.2.3). The sizes range between 2 and 3 millimetres. Sample J9 is almost pure clay, which includes no grit. Samples J3, J6, J7, and J8 had a high percentage of local lime. The lime retains a grey colour when burned at 700 °C. It crumbles above this temperature. There is a great similarity between this sample and the one which was added to the EBI pottery.

#### 3.1.1.6 CONCLUSIONS

The following conclusions may be reached from the data in the Jenin clay study.

Three variables are used to illustrate the relationship between the 11 clay samples (See Figure 4.2.3). Based on these variables, three basic groups are found:

*Clay Type 1* is a primary hematite clay which had few inclusions (Samples J1, J4, J5, and J9). According to the petrographic analysis, the percentage of hematite varied from 30 to 60% of the clay volume. Sample J9 is purely hematite clay. The others are part of the carbonaceous clay. The carbonate clay mass range is from 10 to 30%. Mica also is part of the clay; it composed up to 25% of the clay matrix of samples J5 or J9 and none for sample J1. This sample had basalt instead, which is the only one with this mineral. However, because this type is highly plastic, it required always to be mixed with other tempering agents.

*Clay Sub-Type 1* is a clay formed by eroded rock (J2 and J 3), which is not really a new clay type but a variation of Type 1. However, the samples included all the minerals found in the original contents, which is the source of their strength.

*Clay Type 2* is secondary calcareous clay. It is full of large lime inclusions. Samples J 6, J7, and J8 are of this clay type. After being fired, it showed many similarities with the EBI pottery. They can be noticed in terms of the inclusion of lime and the fired clay colour (see below). Lime formed the highest. Mica and hematite is very

low. Sub-shells inclusions are high.

*Clay Type 3* is a 'river bank' clay, which included a sample of grog. The source is located below an archaeological site, which caused the grog element. The clay is a carbonaceous type, which resembles the clay Type 1 in the inclusion of hematite and calcium. It is, however, residual clay and not a primary one.

Most of the EBI pottery appear to have been made from the local clay resources of the Tell Jenin surroundings. There was no need to add tempering agents because impurities are already included in the clay matrix. Little effort was spent to clean the clay.

During the later EBI phases, the potters recognised the calcite as a tempering agent. Then the clay was cleaned by the levigation method before tempering it. That process is indicated by the existence of the lime grits together with the calcite agent.

There is clear evidence indicating that the potters were experimenting with more than one clay type during the various phases of the EBI period. As indicated above, calcite was not used during the early phases. At this time, the potters used 'impure' clays or clay which naturally included impurities such as lime. For example, calcite was one of the major tempering agents added to clay Type 1.

This kind of clay proves to be of a lower efficiency, especially with forms used as cooking pots. When fired at a temperature above 750 °C, the lime clay crumbles. The alternative for this clay was to select a clay type rich with hematite and to mix it with other clay sources after cleaning it well. Then they added the calcite.

Based on fabric colours and inclusions, it seems that the pottery was fired at around 700 °C. The colours of the fired clay samples and the colours of the EBI showed a lot of similarity at this temperature. When re-fired at 750 °C, the sherds crumbled. It suggests that the pottery could not be fired higher than that.

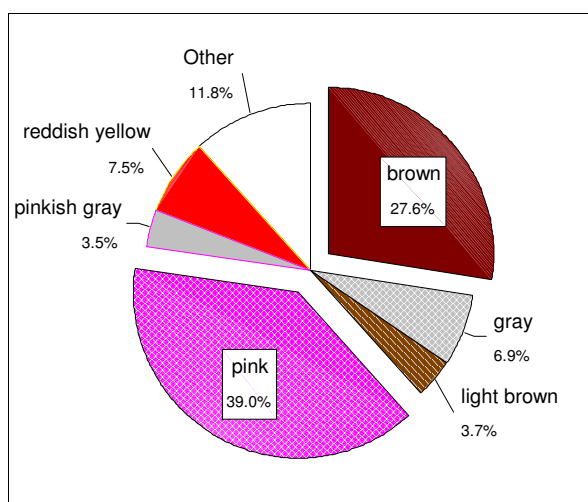
## 3.2 THE EARLY BRONZE AGE POTTERY

### 3.2.1 THE FABRIC (FIRED CLAY AND NON-PLASTICS)

Most of the EBI pottery in both strata is characterised by coarse textures (dominated by non-plastics). Fine textures (or with fewer non-plastics) are also found, especially in Stratum IV. These textures indicate that the potters tended to use clay that had natural inclusions within its contents.

In addition, petrographic analysis showed four clay types: (1) Clay rich in mica and quartz, (2) clay rich in microfossils and sub-shells (3) A mixture of both clays and (4) Rich hematite clay with epodite.

**Figure 4.3.1: Pottery Colours**



#### 3.2.1.1 CLAY COLOUR

The fabric colours of the EBI pottery are of a high variability (Figure 4.3.1). The variation is of a similar nature to the colour of the fired clay from the comparative collection. After conducting experiments with Palestinian clay from Beer es Saba', Leicht (1975: 203-211) had found a relationship between the firing temperature and the colour. His conclusions are useful to compare with the colours of Jenin.

1. Pinkish fired clay is the most dominant fabric of Tell Jenin. The sources of the pink colour are 'incomplete carbon burnout and iron oxides in a low state,' which is probably fired at

800-850 °C (Leicht 1975:207).

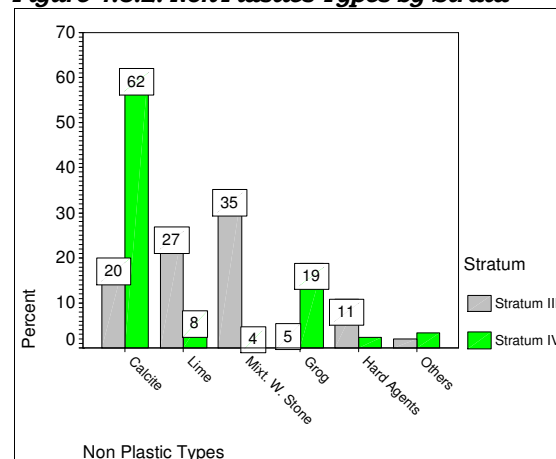
2. Light brown and dark brown colours are included together. These colours are similar to those measured for the clay, which was collected from the mountain area.

3. Reddish-yellow or Yellowish-red pottery are also common. This colour occurs with pottery fired at 700 °C.

4. Reddish-brown pottery and Brown-yellowish pottery are less represented.

5. Grey colours are also less common. The grey colour is affected by the burning of organic materials. It is often resulted from low firing or firing in a reduction atmosphere.

**Figure 4.3.2: Non-Plastics Types by Strata**



**Table 3.3.1 Distribution of Non-Plastics between Strata**

Fabric Type	Stratum III	Stratum IV	Total
Calcite	85 7.2%	413 34.9%	498 42.1%
Lime	102 8.6%	52 4.4%	154 13%
W. Stones	166 14%	27 2.3%	193 16.3%
Grog	10 0.8%	30 2.5%	40 3.4%
Quartz	4 0.3%	0 0%	4 0.3%
Basalt	36 3%	9 0.8%	45 3.8%
Micro Fossils	22 1.9%	6 0.5%	28 2.4%
Flint	11 0.9%	8 0.7%	19 1.6%
Red Calcite	9 0.8%	34 2.9%	43 3.6%
Calcite +Lime	10 0.8%	24 2%	34 2.9%
Lime+grog	7 0.6%	30 2.5%	37 3.1%
Calcite+grog	7 0.6%	76 6.4%	83 7%
Organic	3 0.3%	1 0.1%	4 0.3%
Total	<b>472</b> <b>39.9%</b>	<b>710</b> <b>60.1%</b>	<b>1182</b> <b>100%</b>

### 3.2.1.2 NON-PLASTICS TYPES

*Non-plastic* is a neutral term that describes the aplastic contents of a clay matrix, regardless of whether they were added or original part of the clay. Non-plastics are divided into, temper and inclusions. *Temper* refers to the added non-plastics. *Inclusions* refers to the non-plastics that are part of the clay matrix.

Seven types of non- plastics are found with the clay of the EBI pottery. Table 3.3.1 summarises the distribution of these types (See also Figure 4.3.2): -

1. *Calcite* (including red calcite) is the most common tempering agent in 46% of the entire sample. Calcite comes in milky colours and with angular edges. Altered calcite because of high firing temperature will have light greyish to whitish colours.
2. A tempering agent that was reddish in colour and had a calcite shape is coded separately (*red calcite*), but included in this category. They were found in 4% of the sample. They are of similar nature to the inclusions found with the natural sample J12.
3. The *lime grits* are found in 13% of the sherds. Lime comes with rounded and sub rounded shapes. Many samples were highly fired. It is also part of the clay mixture, which resembles samples J2, J3,

**Table 3.3.2: Distribution of Non-Plastics for Intensity and Size**

Type	Size	Intensity.			Total
		Few	Medium	High	
Calcite	Very Fine	6 (1.2%)	13 (2.6%)		19 (3.82%)
	Fine	11 (2.21%)	165 (33.1%)	41 (8.2%)	217 (43.57%)
	Med. Fine	12 (2.41%)	153 (30.7%)	74 (14.9%)	239 (47.99%)
	Coarse		7 (1.4%)	16 (3.2%)	23 (4.62%)
	Total	29 (5.82%)	338 (67.9%)	131 (26.3%)	498 (100%)
lime	Very Fine	7 (4.55%)	8 (5.2%)		15 (9.74%)
	Fine	9 (5.84%)	58 (37.7%)	7 (4.5%)	74 (48.05%)
	Med. Fine	19 (12.34%)	35 (22.7%)	5 (3.2%)	59 (38.31%)
	Coarse		4 (2.6%)	2 (1.3%)	6 (3.9%)
	Total	35 (22.73%)	105 (68.2%)	14 (9.1%)	154 (100%)
Mix. of W.S.	Very Fine	5 (2.6%)	13 (6.8%)		18 (9.38%)
	Fine	5 (2.6%)	82 (42.7%)	20 (10.4%)	107 (55.73%)
	Med. Fine	4 (2.08%)	46 (24%)	9 (4.7%)	59 (30.73%)
	Coarse	1 (0.52%)	3 (1.6%)	4 (2.1%)	8 (4.17%)
	Total	15 (7.81%)	144 (75%)	33 (17.2%)	192 (100%)
Grog	Very Fine	2 (5%)			2 (5%)
	Fine	3 (7.5%)	13 (32.5%)	5 (12.5%)	21 (52.5%)
	Med. Fine		15 (37.5%)	2 (5%)	17 (42.5%)
	Total	5 (12.5%)	28 (70%)	7 (17.5%)	40 (100%)
Quartz	Fine		3 (75%)		3 (75%)
	Med. Fine		1 (25%)		1 (25%)
	Total		4 (100%)		4 (100%)
Basalt	Very Fine	1 (2.22%)	3 (6.7%)		4 (8.89%)
	Fine	1 (2.22%)	13 (28.9%)		14 (31.11%)
	Med. Fine	2 (4.44%)	19 (42.2%)	5 (11.1%)	26 (57.78%)
	Coarse		1 (2.2%)		1 (2.22%)
	Total	4 (8.89%)	36 (80%)	5 (11.1%)	45 (100%)
Micro Fossils	Very Fine			1 (3.6%)	1 (3.57%)
	Fine		6 (21.4%)	5 (17.9%)	11 (39.29%)
	Med. Fine	1 (3.57%)	14 (50%)	1 (3.6%)	16 (57.14%)
	Total	1 (3.57%)	20 (71.4%)	7 (25%)	28 (100%)
Flint	Fine	1 (5.26%)	3 (15.8%)		4 (21.05%)
	Med. Fine		11 (57.9%)	4 (21.1%)	15 (78.95%)
	Total	1 (5.26%)	14 (73.7%)	4 (21.1%)	19 (100%)
Red Calcite	Very Fine	2 (4.76%)			2 (4.76%)
	Fine		15 (35.7%)	3 (7.1%)	18 (42.86%)
	Med. Fine	3 (7.14%)	16 (38.1%)	2 (4.8%)	21 (50%)
	Coarse			1 (2.4%)	1 (2.38%)
	Total	5 (11.9%)	31 (73.8%)	6 (14.3%)	42 (100%)
Calcite +Lime	Very Fine	1 (2.94%)	3 (8.8%)		4 (11.76%)
	Fine		11 (32.4%)	2 (5.9%)	13 (38.24%)
	Med. Fine	3 (8.82%)	12 (35.3%)	1 (2.9%)	16 (47.06%)
	Coarse			1 (2.9%)	1 (2.94%)
	Total	4 (11.76%)	26 (76.5%)	4 (11.8%)	34 (100%)
Lime+Grog	Fine		18 (48.6%)	1 (2.7%)	19 (51.35%)
	Med. Fine	5 (13.51%)	11 (29.7%)	1 (2.7%)	17 (45.95%)
	Coarse		1 (2.7%)		1 (2.7%)
	Total	5 (13.51%)	30 (81.1%)	2 (5.4%)	37 (100%)
Calcite+grog	Very Fine	1 (1.2%)	3 (3.6%)		4 (4.82%)
	Fine		27 (32.5%)	4 (4.8%)	31 (37.35%)
	Med. Fine		32 (38.6%)	14 (16.9%)	46 (55.42%)
	Coarse			2 (2.4%)	2 (2.41%)
	Total	1 (1.2%)	62 (74.7%)	20 (24.1%)	83 (100%)

- and J8 of the comparative collection.
5. The *mixture of wadi gravels (stones)* (Mix. of W.S.) is found with 16% of the sherds. It refers to round shape grits, which had various colours, namely black, white and grey. It is probably part of the clay component very similar to that in clay samples J6, J7, and J11.
  6. *Grog* was used with 3% of the sherds only, if used alone as a tempering agent. The percentage is close to 13%, if combined with lime and calcite. In most cases, the grog is ground from potsherds that were originally tempered with calcite. Other grog came from sherds that included hematite in them.
  7. *Basalt, flint, and quartz* are all hard agents rarely used as a tempering agent. It is added only to 6% of the sample. The basalt had squared edges, which suggests it is added to the clay. Flint was also rarely used as a tempering agent. It forms 3% of the sample. Quartz is rarely found. It represents less than 1% of the sample.
  8. *Microfossils* are round shaped calcium minerals with air bubbles in it (sponge like shapes). It is part of the clay matrix, and probably not an added temper. It is found with the clay that is collected from the wadi. It is included with the lime because sometimes it is difficult to differentiate between them. Microfossils are found in 2% of the sample.

*Other non-plastics* is a category that indicates a mixture of more than one type.

A combination of more than one type of the above is also found. For example, one of the common mixtures is lime and calcite that is found with 3% of the sample. This type may be an indication that calcite is an added tempering agent to one of the local clays described above.

#### 3.2.1.3 NON-PLASTICS SIZES

The non-plastics size also indicates the

tempering behaviours of the EBI pottery from Tell Jenin (see Section 2.2.2.1.2). Fine non-plastics (of the size of 0.2-1 millimetre) are the most common (Table 3.3.2.), especially when occurred with calcite (12.6%). Very fine and fine calcite are common types (22%). Also medium fine is preferable in the tempering agents during the EBI at Tell Jenin (22%).

Grog is crushed into small grains. Most of the grog is found in the size category of less than one millimetre. Lime and wadi gravels occurred with larger sizes. The preferable size is one millimetre.

Sizes such as these will probably indicate that the non-plastics were sieved before being added to the clay (see Section 2.2.2.1.2).

#### 3.2.1.4 NON- PLASTICS INTENSITY

More than 71% of the sherds had a medium non-plastics intensity of 30%. Intensity of less than 10% is found in only 9% of the sample. Calcite with medium intensity is the dominating group (Table 3.3.2). It occurs in 31% of the entire sample. More than two thirds (68%) of the calcite-temper is added in medium intensity. Most of the lime non-plastics are low in intensity at 1% to 25%. According to Rye (1981: 39), a value of less than 10% of the volume has no effect in the working properties of the clay. The value must be between 25-50% to reduce the shrinkage rate of plastic clay.

It was noticed that less than 30% intensity occurs with the natural clay. This is actually the most common dominant non- plastic intensity, also included in the EBI pottery. It is a strong indication that the ancient potter of Tell Jenin used local clay without the need to temper it with lime inclusions. When a very plastic clay was used, the potters add calcite, grog, and flint as tempering agents.

#### 3.2.1.5 SOME REMARKS

Pottery tempered with calcite is present in only 17% of the groups in Stratum III (Table 3.3.1., Figure 4.3.2). Calcite is the typical temper for Stratum IV (63% of this stratum and 38% of



the entire sample), while lime and wadi stones are the typical inclusions for Stratum III (68%). They became less used during Stratum IV. Grog was not used as a tempering agent during the early EBI phases (Stratum III, Phase 1). It gradually became known during Stratum IV, as 85% of the grog tempered sherds were found contemporary in this stratum.

Hard materials such as basalt and flint were common during Stratum III (75%). They were abandoned during later phases. Quartz as an inclusion is only known in Stratum III. It was not used during the later Stratum.

The mixture of lime and calcite had also a chronological connection for it becomes popular throughout the later phases. Similarly, grog mixed with either calcite or lime became dominant during the later stratum.

Organic tempered pottery is found more in Stratum III than in Stratum IV. It was always mixed with other types, especially with calcite, or lime and mixture of the wadi gravel. Hematite is found within the clay matrix but also it is more common with the sherds that are tempered with calcite. It comes from the red clay Terra Rosa soil of the nearby mountains. Some sherds had shell and fossils in them; they are found mostly with clay that had lime or a mixture of wadi gravels.

In summary, it is clear that not all the clay in the early phases was tempered. Tempering became a dominant behaviour in the later stages

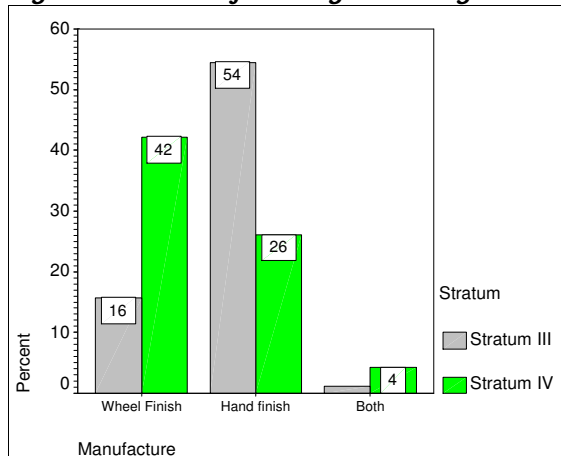
of the EBI period, where the potter could control the plasticity by adding different tempering agents. The previous investigation of the natural clay resources from the Tell Jenin zone supported similar technological behaviour.

### 3.2.2 MANUFACTURING TECHNIQUES

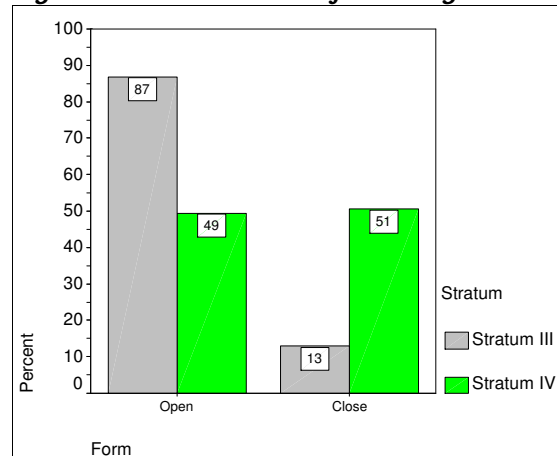
The EBI pottery was made by two methods: Hand coiling, turning, and a combination of both methods. This conclusion is based on a detailed study of the surface markings on complete forms and a wide number of diagnostic sherds. The method was introduced by Own Rye (1981), as well as my own training under the various authorities (Salem 1986). It is obvious that most of the pottery (67%) which was recovered from the earlier EBI phases was handmade. Wheel made pottery is also found with 27% of the sherds. However, Figure 4.3.3 shows that using the two techniques together is a common practice in Stratum IV, indicating that the potters of this period were experimenting with wheel techniques until it was fully adopted in a later stage.

The common manufacturing method was to build the form from bottom to top (See below). The base was made flat and then other coils were attached to it. It was made by placing a clay ball on a parting agent such as a mat, ash, fine sand or on a straw layer. The agent acts as a separator between the clay coil (to make the base) and the ground or the mould. The ball was then beaten by hand and more likely pressed by the palm making a thin flat base.

**Figure 4.3.3: Manufacturing Method by Strata**



**Figure 4.3.4: Distribution of Forms by Strata**

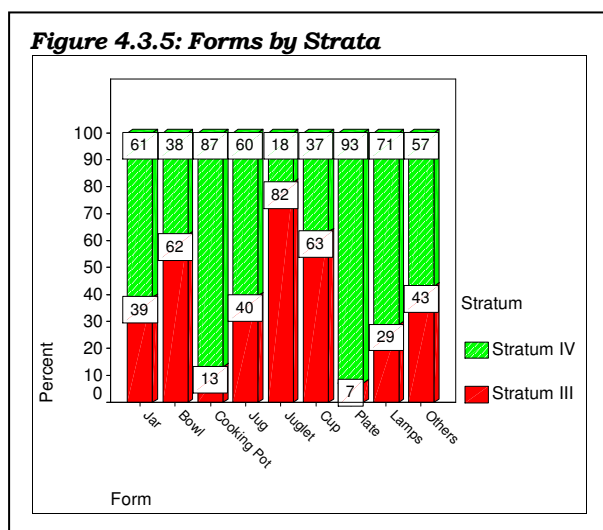


The body was attached to the base by adding two to five coils, depending on the size. Most of the bases showed a fracture at the point where the body attached to the base. In some cases, the fracture was 2 millimetres wide and 12 millimetres long. Evidence of coiling was also identified based on bends on the wall, clay slurry, a double wall and variations of wall thickness. The walls are raised by pressing the clay coil between both hands. Some walls showed casting evidence. The potter used a wooden or stone paddle, a common way that was practised in the early phases, in making some forms. The shoulder was made from a separate clay coil. In case of necked jars, another coil was used to build it. The rim was added to this last piece from another extra clay coil and was shaped to the desired profile. Then the handles were attached, usually to the jar middle.

Finally, the exterior surface was smoothed and a slip coat was applied, which usually covered all traces of the manufacturing processes.

### 3.2.3 POTTERY FORMS

The EBI pottery forms of Tell Jenin are very limited. The repertoire suggests that the pottery manufacturing was done for domestic use. Reconstruction of the forms is made from sherd types by referring to the complete forms. The pottery forms are classified into two major categories: open forms and closed forms. Under these two, more sub categories existed.



**Table 3.3.3: Rim Types between Strata**

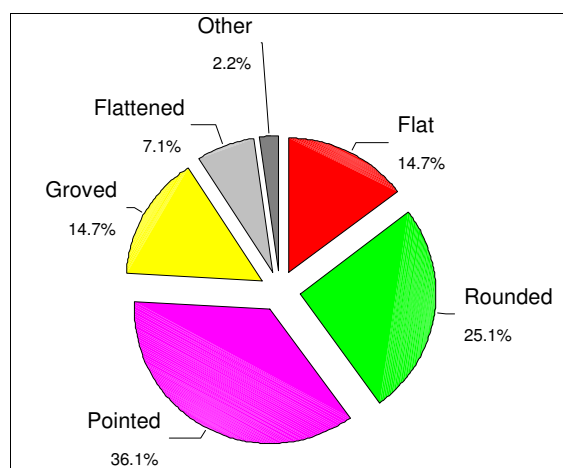
Sherd Form		Stratum		Total
		Stratum III	Stratum IV	
Flat	Count	86	90	176
	% within Form	48.9	51.1	100
	% within Stratum	18.2	12.5	14.7
	% of Total	7.2	7.5	14.7
Rounded	Count	135	165	300
	% within Form	45.0	55.0	100
	% within Stratum	28.6	22.9	25.1
	% of Total	11.3	13.8	25.1
Ring	Count	2	5	7
	% within Form	28.6	71.4	100
	% within Stratum	0.4	0.7	0.6
	% of Total	0.2	0.4	0.6
Pointed	Count	171	260	431
	% within Form	39.7	60.3	100
	% within Stratum	36.2	36.0	36.1
	% of Total	14.3	21.8	36.1
Ridged	Count	8	11	19
	% within Form	42.1	57.9	100
	% within Stratum	1.7	1.5	1.6
	% of Total	0.7	0.9	1.6
Grooved	Count	32	144	176
	% within Form	18.2	81.8	100
	% within Stratum	6.8	19.9	14.7
	% of Total	2.7	12.1	14.7
Flattened	Count	38	47	85
	% within Form	44.7	55.3	100
	% within Stratum	8.1	6.5	7.1
	% of Total	3.2	3.9	7.1
Total	Count	472	722	1194
	% within Form	39.5	60.5	100
	% within Stratum	100	100	100
	% of Total	39.5	60.5	100

Closed forms are the most dominant types for both strata (Figures 4.3.4., 4.3.5). They represent 50% of the types in Stratum III and 71% of the types in Stratum IV. More open forms are found in Stratum III, than in Stratum IV.

### 3.2.4 SHERD TYPES

#### 3.2.4.1 RIMS

Rim sherds represent 31% of the sherd collection (Table 3.3.3). One major purpose in shaping a rim is to protect the tip from being eroded. According to that, the rims had the following shapes (Figure 4.3.6.):

**Figure 4.3.6: Rim Types**

1. A *flat* rim is made when the top of the rim is cut to a plain tip (For example see Figures 5.1.3, 5.1.17, 5.1.18, 5.1.20, 5.1.43, 5.3.1, 5.3.4). It had angular sharp edges. Flat rims are mostly finished on the wheel. Some were finished by hand. They are made from the same coil used to build the upper shoulder. After pulling up the clay, the potters level the tip with the finger or by cutting it with a tool.

Flat rims represent 15% of the total sherds (Table 3.3.3). It is a typical type for both strata.

2. *Round* rims are the most typical in the Jenin collection (25%). The tip is finished to a round edge (For example see Figures 5.1.24, 5.1.36, 5.1.38, 5.3.27, 5.3.29). Round rims are made often with a separate clay coil. After the walls are lifted, the potter creates a rounded edge. The new coil is attached both inside and outside of the wall. The evidence for this coil is seen by a small fracture in the wall section. Sometimes the connection point is too weak and causes the rim to collapse. Round rims are represented in the two strata (45%: 55%).

3. *Ring* rims are made by folding the coil ends at the interior or by adding a separate coil to the body coil. They are not well represented in the collection (1%). They become more common during the later EBI phases.

4. *Pointed* rims are finished to a sharp

edge. Pointed rims are made by pulling up the clay between the tips of three fingers (For example-Figures 5.1.30, 5.1.39, 5.3.11, 5.3.14). This process is done with or without the use of a wheel. Pointed rims are the most dominant type (36%). This rim type becomes more dominant during the later EBI phases.

Rounded to a point rim is a distinct type of the pointed rims that had rounded sides but ends with a tip (For example see Figures 5.1.27, 5.1.29, 5.2.1). It is made on the wheel, by pulling up the clay gently between the two fingers. It had a low frequency.

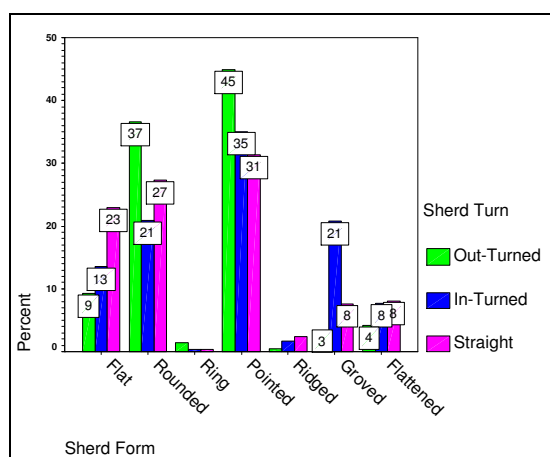
5. *Ridged* rims are rims that had 'grooved sides' or pending edges (For example see Figure 5.1.22). They are made with the help of a tool or with the middle finger back. They are not common types (1%), and are mostly found in Stratum III.

6. *Grooved* rims are rims that had an incised or grooved top (For example see Figures 5.1.1, 5.1.2, 5.1.5-5.1.16). The groove is made with the help of a stick. The grooved rims are common in the collection with 13% of the total sherds. The grooved rim is typical for the second stratum (82%). It is found more with the closed forms, and hardly come with the open forms. Grooved rims are more typical for Stratum IV than Stratum III.

7. *Flattened* rims are rims with slanting and bevelled tips with semi- rounded edges (For example see Figures 5.1.4, 5.1.38, 5.3.2). This type of rim is made by pulling the clay up between the fingernail and the forefinger. It is not separated from the body. They are types that are more common for Stratum IV (55%). In both strata, they show similar representation among all the types (8% and 9%).

#### 3.2.4.2 RELATION BETWEEN RIM TURN AND RIM TYPES (Figure 4.3.7)

*Rim turn* is a technological indication of the pot finishing process. The turn is also indication of the pot's intended use. Some rims, especially

**Figure 4.3.7: Rim Types by Rim Turn**

of the out-turned type, are turned to place a lid.

1. Turning the rim to the inside is the most common technological behaviour (61%). More than half (56%) of the flat rims were turned to the inside. More than 33% were straight. About half of the round rims were turned to the inside. The pointed rims are usually turned to the inside (60%); it is the most common combination of all the types (22%).

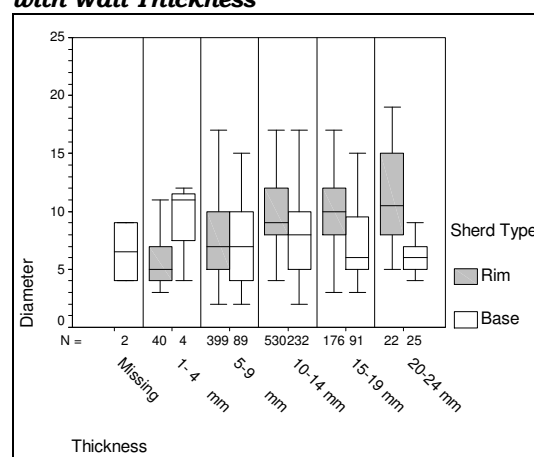
2. Turning the rims to the outside is the least dominant technological behaviour. They occur with neck jars and juglets. Usually the out-turned rim occurs with the pointed rim and rounded rims. The other types occur with a small combination.

3. The straight rim is the second most common type (21%). Again, rounded and pointed rims are the most common.

The flat rim without a turn is not a common type. The straight round rims are less common (19%). Nevertheless, it is still representing the highest percentage of the straight rims.

#### 3.2.4.3 RIM DIAMETER AND WALL THICKNESS

The rim diameter is recorded into four categories. The very small category of 1-4 centimetres occurred with 7%. Half the rim sherds were in the small category with 5-9 centimetres in diameter. More than one third of them are fallen into the medium categories (10-19 centimetres). The large category was the least represented. The closed forms had the smallest diameter range. More than 50% fall in a class

**Figure 4.3.8: Relation of Rim to Base Diameter with Wall Thickness**

with a diameter smaller than 9 centimetres.

In addition, most of the sherds fall into the thickness of 10-14 millimetres (45%). The next is 5-10 millimetres thick (35%). The common pattern relating the rim diameter and wall thickness is that: *large diameters occur with thick walls* (Figure 4.3.8). A larger diameter with a thicker wall is common in Stratum III. If related to the manufacturing techniques, then the potters build wider diameters with thick walls. Otherwise, the pot will collapse. By using the wheel, the potters can master the thickness and the diameter together. Thin walls with wider diameters are made.

#### 3.2.4.4 RELATION OF RIM TO DIAMETER BASES

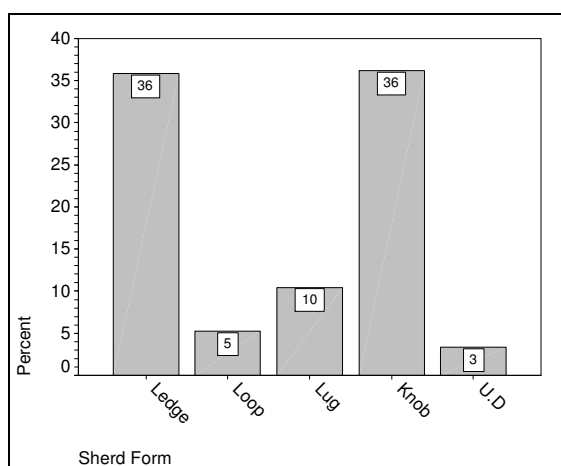
Figure 4.3.8 indicates the relation between wall thickness, rim diameters and base diameters. Obviously, there is a relationship between the rim diameter, the wall thickness, and the base diameter.

Thin walls occur with narrow mouth and wide bases. Contrary, walls thicker than 10 mm occur with wide mouth and narrow base.

The open forms usually occur with wider mouths and narrow bases, while the closed forms occur with narrower mouths and wider bases.

#### 3.2.4.5 HANDLES

Handles are represented by 268 sherds or 7% of the entire collection. About 58% were found in Stratum IV and the rest in Stratum III. The handles are coded into four types (Figure 4.3.9):

**Figure 4.3.9: Handle Types**

1. The *ledge* handle is made by pressing a round clay ball into bread-loaf shape. It is then cut into halves and attached horizontally to the body (Figures 5.4.1-5.4.5). It is the most common type in the EBI period. The majority (80%) of these sherds becomes dominant during Stratum IV. Ledge handles are common with closed forms. They exist with only seven open forms. One third of them were used with juglets and jugs, and the rest among jar forms.

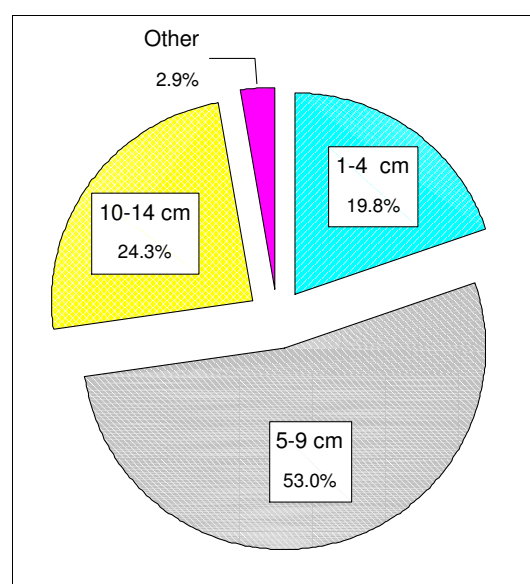
2. The *loop* handle is made from a clay cylinder (Figures 5.4.16-5.4.27). This type was common with 40% of the handles. The loop handles are found in both strata, but they are more common in Stratum III. Loop handles are more common for the closed forms (80%). They are more represented among jar forms. Small high loop handles of the known type were found. They belong to the typical red burnish jugs.

3. The *lug* handle is a very small clay earlike projection, which is attached at the vessel shoulder (Figures 5.4.11-5.4.15). Lug handles are common in Stratum III (71%). It is a common type for both the open and closed forms, but among the total handles of the closed forms, they are mostly used with jugs and juglets.

4. The *knob* handle is a small clay protrusion, which is attached to the body and shoulder (Figure 5.4.6-5.4.9). The handle is attached directly to the walls. Because of its size, it joins with the walls and becomes part of it. This handle type is more common in Stratum IV than Stratum III. They are more common with the open forms (70%) and they are the typical

handles for them. Of all closed forms, they are used with jugs only.

Apparently, the handle type had a significant chronological indication to the EBI pottery of Tell Jenin. During the early phases, the loop handles were used with the jars. During the later phases, they were replaced with the ledge handles. In addition, the knob and the lug handles were used only with small forms, especially jugs and bowls. They are more common for Stratum III. Similar to the ledge handles, this type of handles was replaced by the small loop (or ear shape) type during the later phases.

**Figure 4.3.10: Base Diameters**

### 3.2.4.6 BASES

The EBI bases are made in three ways. The first one is the string cut method, the second one is the impressed method, and the third one is the pulled up method.

1. The *string cut* bases are made often with the small sized bowls and juglets (Figure 5.5.1). It is a clear indication that more than one form was made from the same lump.

2. The *pulled* base (Figures 5.5.17) means that the potter pulled the form after it was finished without using a string.

3. *Mat impressed* (Figures 5.5.19) bases are



common. The potter used a straw mat or a heap of ash and pressed the base on top of them.

The bases represent 17% of the total sherd collection. Many bases belong to closed forms (73%). Rounded bases are found mainly in Stratum III.

The bases are found more with jar (49% of the total forms). Jug bases were represented by 21%. Bowl bases are present with 25%.

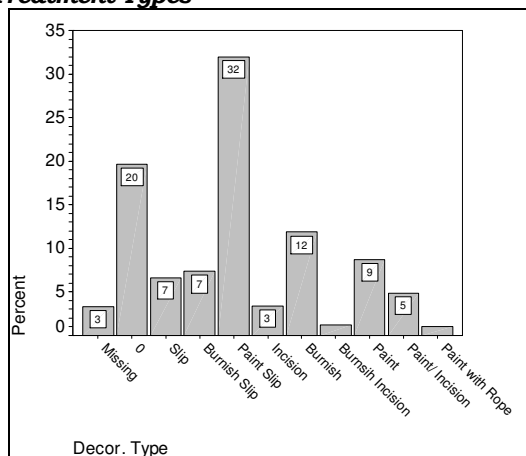
Most of the bases (53%) had a diameter of 5-9 centimetres. Another 25% fall in the category of 10-14 centimetres. Bases with a small diameter of 1-4 centimetres are found with 18% of the base sherds. Around half the bases (51%) had a thickness of 10-14 millimetres. Thin walled bases with a thickness of 5-9 and thicker bases of 15-19 millimetres compose the other half.

### 3.3 SURFACE TREATMENT AND DECORATION

The majority of the EBI pottery from Tell Jenin was decorated. Non-decorated sherds are less common (21%) than the decorated sherds. The non-decorated pottery is more typical for Stratum III than Stratum IV (Table 3.3.4). The decorated sherds represent 69% of the entire collection. The most typical decoration types are indicated in (Table 3.3.4 and Figure 4.3.11):

1. *Paint slip* is applied by dipping the whole form in paint. The paint can also be poured into the pot. The slip is usually applied with different

**Figure 4.3.11: Distribution of Surface Treatment Types**



**Table 3.3.4: Distribution of Surface Treatment Types between Strata**

		Stratum		Total
		Stratum III	Stratum IV	
<b>No. Decor.</b>	Count	529	220	749
	% within Decor. type	70.6	29.4	100
	% of Total	14.3	6	20.3
<b>Slip</b>	Count	196	57	253
	% within Decor. type	77.5	22.5	100
	% of Total	5.3	1.5	6.9
<b>Burnish Slip</b>	Count	95	186	281
	% within Decor. type	33.8	66.2	100
	% of Total	2.6	5	7.6
<b>Paint Slip</b>	Count	202	1019	1221
	% within Decor. type	16.5	83.5	100
	% of Total	5.5	27.6	33.1
<b>Incision</b>	Count	122	8	130
	% within Decor. type	93.8	6.2	100
	% of Total	3.3	0.2	3.5
<b>Burnish</b>	Count	376	77	453
	% within Decor. type	83	17	100
	% of Total	10.2	2.1	12.3
<b>Burnish Incision</b>	Count	34	13	47
	% within Decor. type	72.3	27.7	100
	% of Total	0.9	0.4	1.3
<b>Paint</b>	Count	279	54	333
	% within Decor. type	83.8	16.2	100
	% of Total	7.6	1.5	9
<b>Paint/ Incision</b>	Count	25	162	187
	% within Decor. type	13.4	86.6	100
	% of Total	0.7	4.4	5.1
<b>Paint with Rope</b>	Count	17	22	39
	% within Decor. type	43.6	56.4	100
	% of Total	0.5	0.6	1.1
<b>Total</b>	Count	1875	1818	3693
	% within Decor. type	50.8	49.2	100
	% of Total	50.8	49.2	100

colours than the original pottery colours. Red soil is often used to make the paint to obtain red and brown colours. The slip paint is the most typical way of decoration (40%). It is applied during the last stage before firing.

Red paint slip is the most common way,

followed by brown slip. Paint alone is applied to 25% of the painted forms. Paint pattern involves either a single line below the rim, or on top of the rim and at the neck. Net pattern paint lines are rare.

2. The decoration with *slip coating* involved dipping the pot in clay slurry probably from the same clay used in making the pot. The slip may be also applied by a piece of cloth. It is identified with a thin coat. The slip is a common decoration behaviour used in the earliest phases. More than 79% of the slipped sherds were found in Stratum III.

3. *Polishing* involves rubbing the leather hard clay by a tool to make the surface smooth. It is a common behaviour for Stratum III. It is hardly found in the second stratum.

4. *Slip Burnishing* and *Burnishing*: The slip burnish method involved coating the pottery with a layer and then rubbing it with a tool. The surface becomes shiny. Marks that resulted from using the tool are obvious. It is likely that a stick or a bone was used. Stone tools may have been used as well. The slip burnish style is common with 6.6% of the decorated pottery.

Burnishing alone is common in the later stratum, which is represented by 71% of the burnished sherds. The method is common with jugs and juglets (27%), more than with the jars.

5. *Burnishing* alone was also applied to the entire surface. Around 5% of the collection show this type of burnishing. The majority (71%) of burnished sherds belong to open forms, 28% are closed forms.

6. *Incision* alone is not a common EBI pottery decorative feature. Incised sherds without any other decorative features represent 3% of the collection. With other features, like slip paint, they represent 10% of the sherds. The incision is of both complicated and simple patterns.

*Notches* are the most commonly used incision pattern (58.5%). They are used mainly with the hole-mouth Jars (79.9%) (see For example

Figures 5.1.1, 5.1.3., 5.1.4). The notches are made by pressing the clay with the top of a tool, probably the tip of a bamboo stick. The notches are oriented to the right (/), to the left (\) or formed of solid lines straight with the rim (--) or straight dotted lines (...). The left notches are the most common. The notches alone are not a common practice. They were applied with only 22 cases (14%). In many cases, they were combined with paint decoration (12%) or slip paint decoration (64%).

*Chevron* pattern is represented with 7% of the sample (Figure 5.3.29). It is more typical for Stratum III. Usually, it is applied without any other decoration type.

Incision with *fine wavy lines* is more common to the earliest Stratum (90%).

*Indentation* is made by a combing tool or the fingernail tip (Figures 5.7.1-5.7.4). The fingernail indentation is one of its variations. It is applied by the fingernail instead of a tool. It is a rare pattern and only can be found in Stratum III.

7. *Pinching* is applied by holding the clay between the fingertips (Figure 7.3). This decorative type is typical for the early stratum without any single sherd found in the latest stratum.

8. *Rope* decoration is composed of a plastic clay stripe, which was usually placed under the shoulder (Figures 5.1.30, 5.7.6). This type of decoration is applied either alone or is combined with other decorative features. When alone, it is typical for Stratum III. It became typical in Stratum IV if it was combined with slip paint decoration. This type of decoration is not common with the jars; it is found with the bowls.

## 4 TYPOLOGY OF THE EARLY BRONZE AGE POTTERY

### 4.1 THE CLASSIFICATION SYSTEM

The classification objective is to create groups whose members are very similar on the principle "that the similarity of entities within groups does

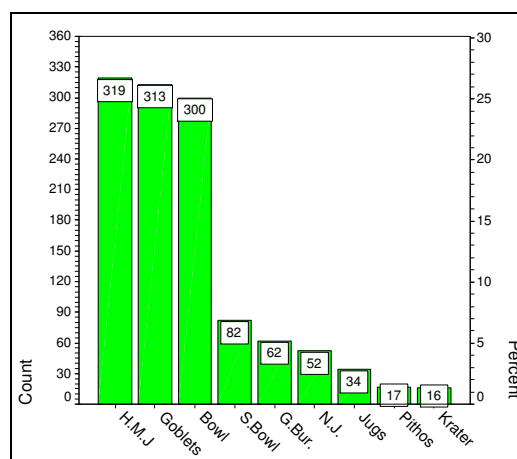
*not occur by chance*" (Rice 1987: 274). One of the basic problems of grouping pottery is to select the traits that represent the type. With the advance of statistical method, it became possible to cluster several traits and so create the first step in the quantitative typology method. Quantitative typology assists in understanding the correlation between the vertical -space and horizontal-time distribution of the pottery types. For this purpose, each type is clustered in a numerical value to be measured quantitatively. Having a numerical value for each variable will lead to a better representation of the relationships between the variables measuring change through time (Shennan 1988: 5). Obviously, this is the only mean to recognise the dominant types from those that are less dominant.

The classification system of Tell Jenin pottery is based on clustering four fundamental traits: The forms, the raw materials, the manufacturing techniques, and the surface treatment.

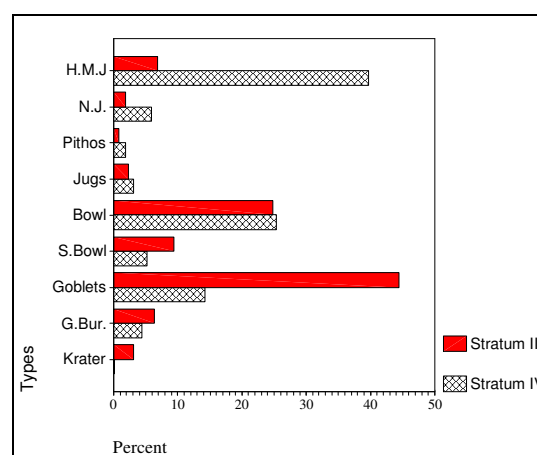
STRATUM  
=>FORM  
=>NON-PLASTICS  
=>DECORATION  
=>MANUFACTURING METHOD  
=>FORM VARIATIONS

*The form* is a major entity in grouping pottery. Palestinian traditional potters recognise the form as a means of innovation. They are aware of the need to create new forms in order to compete with other potters. The form is developed either by adding new accessories or by making a new one. A mediator usually suggests the new forms, as the case of the Hebron potters. It can be also copied from other potters, such as the Lebanese style pitcher made by the Gaza potter (according to a potter from Gaza). In some cases, the form can be copied from archaeology. There is a clear relationship between the form and specialisation. Abu Ali is making forms that serve as water containers (mainly pitchers). The village pottery of Sinjil and el-Jib is a clear indication of specialisation. The potter of Sinjil specialised in making storage jars and el- Jib makes cooking pots. Attempts to make other forms failed because the potters can only master the forms

**FIGURE 4.4.1: Bar Chart of all Pottery Types**



**Figure 4.4.2: Bar of Types per Strata**



that they are used to make. Therefore, pottery forms are the first category that can be used to classify EBI pottery. The complete vessels can better define the EBI types of Tell Jenin. I used complete forms and the rim shapes as a main attribute to group the pottery. The majority of the forms can be then identified by their rims.

*The raw materials*, that is clay and non-plastics, is another category that can be used to differentiate between the pottery types (see Section 1 for a definition of *type*). On the one hand, potters are aware of the relationship between the pottery colour and the clay type, the clay treatment with colorant agents, and on the other the control of the firing method. According to that, they classify the thrown pottery into three categories, the red pottery, the black pottery and the white pottery. The red pottery is a result of



using the Terra Rossa soil, a clay heavy with iron. This type is observed mainly with the Hebron potters. The white pottery is a result of adding salt to the clay. The potters who had contact with the sea, like the Haifa potters or potters who are refugees from coastal regions use this method. The black or grey pottery is a result of firing the pots in a reducing atmosphere. It is a common method of Gaza potters.

On the other hand, the relation between the form and the non-plastics is obvious to the traditional potters. El- Jib cooking pot makers always add calcite to the clay, while Sinjil jar makers add grog. Furthermore, the male potters add only fine sand as tempering agent to water jars, to make them more porous and so increase permeability.

*Manufacturing techniques* is also an important element to distinguish the pottery groups. The potters evaluate another skilled potter by his skill to produce a good form. A good form is the one that has thin walls and a finely finished shape. Actually, the change of form is due to the technique used. Many potters are aware of the relationship between the form and the manufacturing techniques. To produce thin walled pottery, the potters followed the “stage techniques” called *tajlees*. The wheel-made pottery is made by *et-tajlees* method. As noticed with the Jaba' potters, the method can be modified by increasing the number of stages to make the process of manufacturing easier. The number of the stages depends on the size and type of each form.

The other category is the *surface treatment*. In the traditional pottery, decoration may define a class of pots. The painting tradition on jars, which is common with the pottery of Beit 'Anan or Sinjil, is a tradition that carries many similarities with the pottery from the Mamluke period. It was suggested that this tradition was brought to Palestine from Egypt (Homes-Fredricq and Franken 1986: 241). The use of a certain style of decoration may not only be a chronological factor but also an abstract identifier of a tradition. The case is clear with the Grey Burnished pottery, which had been a

**Table 4.1: Distribution of Pottery Types Between Strata**

Type	%	Stratum III	Stratum IV	Total
H.M.J	Count	32	287	319
	% within Types	10.0	90.0	100
	% within Stratum	6.8	39.7	26.7
	% of Total	2.7	24.0	26.7
N.J.	Count	9	43	52
	% within Types	17.3	82.7	100
	% within Stratum	1.9	5.9	4.4
	% of Total	0.8	3.6	4.4
Pithoi	Count	4	13	17
	% within Types	23.5	76.5	100
	% within Stratum	0.8	1.8	1.4
	% of Total	0.3	1.1	1.4
Jugs	Count	11	23	34
	% within Types	32.4	67.6	100
	% within Stratum	2.3	3.2	2.8
	% of Total	0.9	1.9	2.8
Bowl	Count	117	183	300
	% within Types	39.0	61.0	100
	% within Stratum	24.8	25.3	25.1
	% of Total	9.8	15.3	25.1
S.Bowl	Count	44	38	82
	% within Types	53.7	46.3	100
	% within Stratum	9.3	5.3	6.9
	% of Total	3.7	3.2	6.9
Goblets	Count	210	103	313
	% within Types	67.1	32.9	100
	% within Stratum	44.5	14.2	26.2
	% of Total	17.6	8.6	26.2
G.Bur.	Count	30	32	62
	% within Types	48.4	51.6	100
	% within Stratum	6.4	4.4	5.2
	% of Total	2.5	2.7	5.2
Krater	Count	15	1	16
	% within Types	93.8	6.3	100
	% within Stratum	3.2	0.1	1.3
	% of Total	1.3	0.1	1.3
Total	Count	472	723	1195
	% within Types	39.5	60.5	100

distinguishing marker for the EBI pottery.

As noted earlier, the focus on the typological/quantitative approach is a mean for presenting the pottery types from a site based on the technological traits. One of its objectives is to find the traits that were dominant in a certain EBI phase over those which were not dominant.

By doing so, the sherd is placed into one of the patterns that were clustered by the common attributes. The result was a table of nine types (See Table: 4.1, Figure 4.4.1, 4.4.2)).

## 4.2 THE POTTERY TYPES

### *Closed Forms*

#### *Jars*

Three jar types are found, namely the hole-mouth jar, the neck jar, and the pithos.

#### 4.2.1 **Type 1: Hole-Mouth Jars**

##### *Description and Sub Types*

The hole-mouth jar is a neckless closed form that had a wide mouth and a short shoulder. It is the most characteristic EBI pottery type (Table 4.1, Figures 5.1.1-5.1.29), representing 27% of the entire group. The type had a globular body with two ledge handles attached at the middle.

The sherds are divided mainly into four sub-types, distinguished by the rim-shaping methods. The four types are the flat rim, the grooved rim, the rounded rim and the rounded-to-a-point rim. Each one of these sub-types occurs with distinctive features.

##### 4.2.1.1 **SUB-TYPE 1 HOLE-MOUTH JARS WITH FLAT**

This sub-type of hole-mouth jar comes with a flat and thick squared rim (Figure 5.1.3, 5.1.4, 5.1.17). Sometimes the rim was cut to the inside. The rim contour also is turned gently to the inside, leaving a very short round shoulder. More than quarter of the sherds, (26.4%) represents this sub-type. It is typical for Stratum IV, where 91% of the sherds are found.

##### 4.2.1.2 **SUB-TYPE 2: HOLE-MOUTH JARS WITH GROOVED RIMS**

The grooved rim is characterised by a tip that had a long furrow (Figure 5.1.2, 5.1.11, 5.1.14). It is the most common type among the hole-mouth jars (29%). Like the previous sub-type, this type is also more common in Stratum IV.

The groove is made either by the fingertips or by the point of a stick. One complete jar was found, giving an idea about the shape and manufacturing technique (Figure 5.1.6). The jar had a globular body and a slanting shoulder, flat base and no handles.

##### 4.2.1.3 **SUB-TYPE 3: HOLE-MOUTH JARS WITH ROUNDED RIMS**

(Figure 5.1.23-5.1.25)

The round rim is made on the wheel. The rim is turned gently to the inside, making the opening narrower than the shoulder. This sub-type occurs with a globular body, no handles and a flat base. Few forms have a rounded elongated body similar to the one observed with some neck jars. The sub-type is less common than the other ones (15%).

##### 4.2.1.4 **SUB-TYPE 4: HOLE-MOUTH JARS WITH ROUNDED TO A POINT RIM**

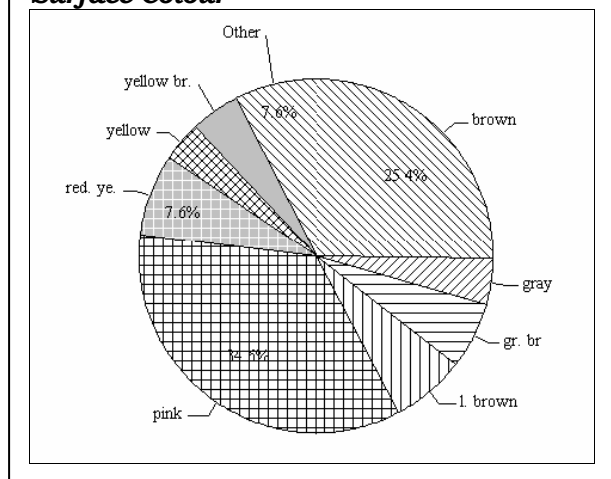
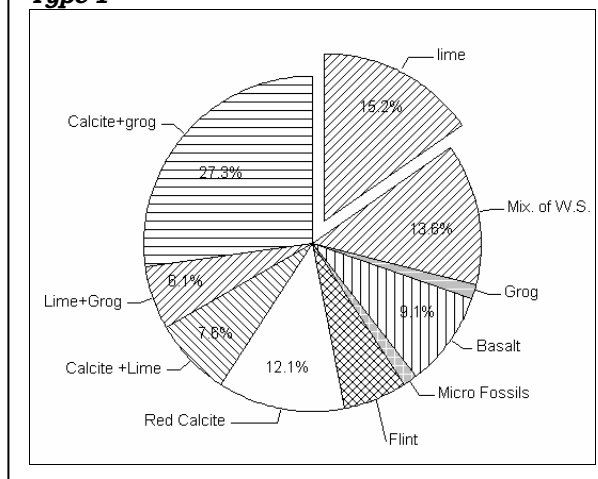
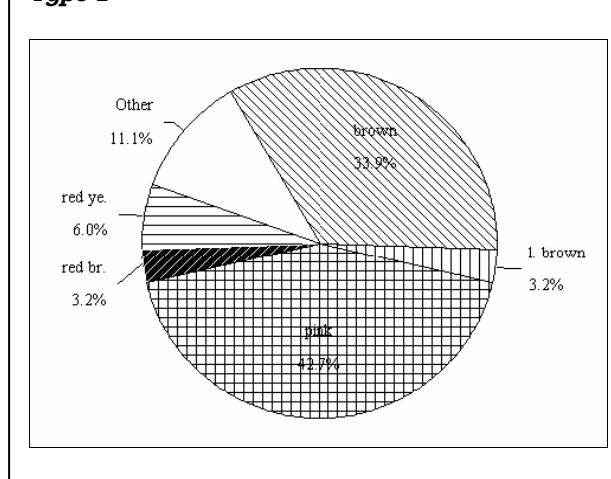
(Figures 5.1.26-5.1.32)

Instead of making the rounded rim, the potter decided to raise it to a point. This sub-type is found mainly in the later EBI phases. It represents 28% of the sherds. It is among the common types of the EBI.

The surface treatment is one distinguishing feature between sub-types. While the round and round to a point type occurs with the common red slip paint, incision slashes with slip paint occur with the flat and grooved sub-types.

#### *Colour*

The interior and exterior colours show a similar range. The typical colours are brown and pink, with minor variations. The MSCC reading variation for this type is as follow (Figures 6.1.1.1, 6.1.1.2.): brown (10YR6/3, 10YR7/3, 10YR7/4, 10YR8/3, 10YR8/4, 7/5YR5/4), light brown (7/5YR6/4), grey (10YR6/1, 10YR7/2), greyish brown (10YR5/2, 10YR6/2), pink (5YR7/4, 5YR7/6, 5YR8/4, 7/5YR7/4, 7/5YR8/4, 7/5YR6/2), red (25YR6/6), reddish brown (5YR5/4, 5YR6/4), reddish yellow (5YR5/6, 5YR6/6, 7/5YR7/6, 7/5YR8/6), yellow (10YR7/6, 10YR8/6), yellowish brown

**Figure 6.1.1.1: Pies Chart of Interior Surface Colour****Figure 6.1.2: Pie Chart of N-Plastic Types for Type 1****6.1.1.2: Pie Chart of Exterior Surface Color for Type 1**

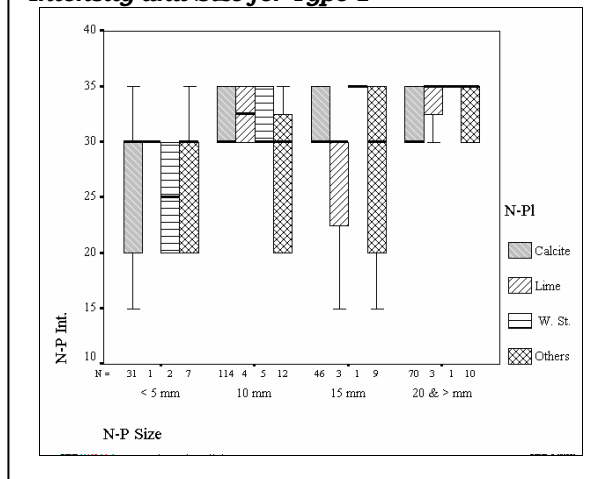
(10YR6/4).

### Measurements

The rim diameter range is from 4 to 19 centimetres, with an average of 9 centimetres. About 66% of the rims fall in the size of 5 to 9 centimetres. Larger and smaller sizes than that are rare. The thickness ranges from 3 to 25 millimetres with an average of 13 millimetres. A thickness range of 10 to 14 millimetres is found in 60%.

### Fabric

Thin section analysis indicates that the hole-mouth jars are made from more than one clay type. They are mainly made from Type 2 clay, composed of microfossils and sub-shells. Type 1

**Figure 6.1.3: Box plot of Non-Plastics Type, Intensity and Size for Type 1**

clay (mixed with hematite, mica and quartz) was used with few sherds. Many thin sections show a mixture of the two types with the dominance of one type over another.

Calcite is the major tempering agent in the majority of thin sections. It was combined with grog, lime, hematite and feldspar. Some thin sections had basalt and quartz. Very few sherds had epidote or botanical remains as tempering agents.

Macroscopic analysis of all the sherds had shown a similar fabric (Figure 6.1.2). Calcite is the major tempering agent, which is found with 79% of the sherds. Other non-plastics include lime, mixture of wadi stones mainly of basalt, grog mostly mixed with lime, basalt, microfossils and flint. Hard materials such as basalt or flint

were found mainly in Stratum IV.

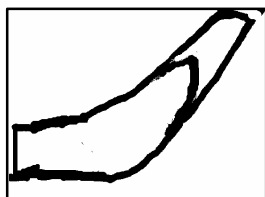
Non-plastics intensity ranges from 10% to 50%, with an average of 30%. Their size ranges from 0.5 to 2 millimetres. The average size is one millimetre. The majority are fine non-plastics.

Figure 6.1.3 shows that the fine calcite is added in medium intensity 20 to 30. Calcite with a size of 1 millimetre is added in a higher percentage. Lime, mixture of wadi stones and the other non-plastic types showed a similar intensity.

#### *Manufacturing Method*

##### *Method A*

The jar is made from three or four coils. First, the flat base is made from a clay ball that is pressed flat by the palm after being placed on a fine straw hump. The base colour on the inside (grey) is darker than the outside (yellowish or Y 8/3 or a very pale brown). Part of the wall is built during forming the base bottom. To raise the wall, the base bends slightly to the inside, and at the same time the wall becomes thinner toward the top to insert another coil. This process is evident by a 'double wall' at the joint of the two coils. This means that the base is done in two stages. The first stage is the bottom part and then the upper part is added before it dries out. The upper coil is added when the base is completed. It has to join when it is damp. If it dries out, it will not stick completely to the body. To secure the connection between the two coils, the potter adds an extra clay joint from the inside. This piece of clay extends two centimetres from both joint sides. It joins well with the body coil and becomes part of it. At one point, the body coil dried out, leaving a shrinkage fracture of about 3 millimetres separating the base from the wall. The thick body is gently smoothed, maybe by a tool or a piece of cloth. The base thickness where it joins is 22 millimetres. The base thickness toward its middle is 10 millimetres.



The wall thickness after the joint becomes 13 millimetres.

The third coil is added to build the body. Traces of this coil appear at 12 centimetres above the base. The wall surface is irregular. There is evidence of shaving from outside shown as a trace of long vertical marks and strokes.

Evidence of a sharp tool is also clear from the inside. Both traces suggest that the wall is built thick and trimmed later on. There is also a possibility that the wall was beaten by a paddle and anvil.

The fourth coil is added to raise the middle part of the body. The previous coil edge is made sharp and bevelled to the inside to connect both sides. The thicker part of the new coil is from the inside.

The fifth coil is added to create a bending shoulder. The rim is attached to the shoulder with a separate clay coil extending for three centimetres. It is attached by the turning method. From the sherds collection, it is noticed that some rims were finished by wheel. However, some other rims were finished by hand. It is clear that the rim is made from a separate coil. The coil is wrapped around both sides of the shoulder. This made the rim thicker. The brim is trimmed with a stick. The grooved rim is made by the fingertips, for as evidence of fingerprints was noticed between the grooves. The rim then is curved to the inside to narrow the mouth.



It is likely that the rim shape is made to create a ridge for a lid. This kind of hole-mouth jar is probably used as a cooking pot.

##### *Method B*

The surface markings indicate that the jar was thrown on a slow wheel. It may be that the jar was made by pressing a clay hump at a top of a disk. When opening the hump, the potter starts

raising the form from bottom to top. The rim is built by pulling out the clay with the two forefingers. Rather than adding a separate coil, the rim is thrown or coiled from the same coil that is used to build the shoulder. The non-plastic orientation was oriented upwards, in the clay pulling direction.

The thin regular walls suggest that it was wheel finished. The rim is made rounded to a point. It is made thick and folded to the outside (3.5 centimetres high). This type of rim is difficult to fold by the fingertip without the use of a revolving force.

#### *Surface Treatment*

The decoration was made from the typical light red (7.5 Y 7/4) slip paint, which became dark greyish brown (10 Y 4/2) (37%) (Figure 6.1.4). Probably, these were post use colorations indicating that the jars were used as cooking pots. A line of incision slashes surround the shoulder, about 4 centimetres below the rim. The distance between one slash and another is about 2 centimetres. The slash orientation is parallel to the rim line. A sharp tool made it while the clay was wet.

Slip paint alone is also found on many sherds (40%) with the round rims. It is equivalent to what is often referred to as grain washed technique. Less than 2% of the sherds come with a rope decoration often combined with paint.

Some sherds were polished or burnish, mainly of the red slip burnish. Line painting and incision alone is not a common surface treatment for the pottery.

#### *Firing*

The jars were fired in a non-homogeneous atmosphere. Evidence of sooting and discoloration (red and yellow) are found at the surface as a result of firing. Some of these may be a result of post deposition factors, especially when dumped in a fire or organic materials.

The pottery is fragile and easy to break. A high percentage of cores are grey. In some places, all the core area is grey. Some cores have irregular shape and random orientation. In addition, the interior wall is grey indicating that this part was not fully oxidized. All these factors suggest that the firing was low and more likely it occurred in the open without using a kiln. The jar during firing probably stands with the base down. Furthermore, many other sherds belonging to this type had light grey, yellow or red cores. The cores are of non-continuous lines, which suggest that these pots were fired in a homogenous atmosphere at a high temperature. A kiln may have been used to fire them.

#### 4.2.2 **Type 2: Neck Jars**

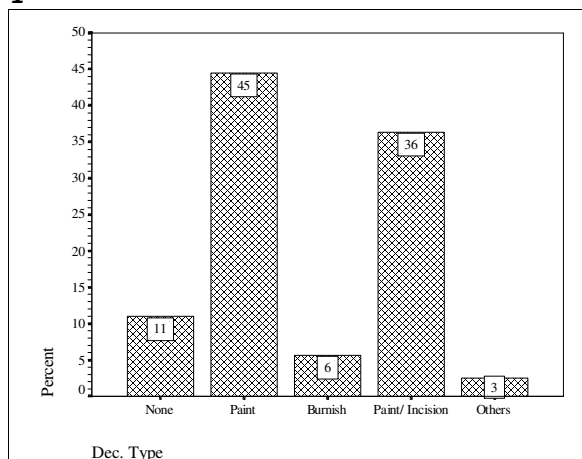
(Figure 5.1.30-5.1.41)

##### *Description*

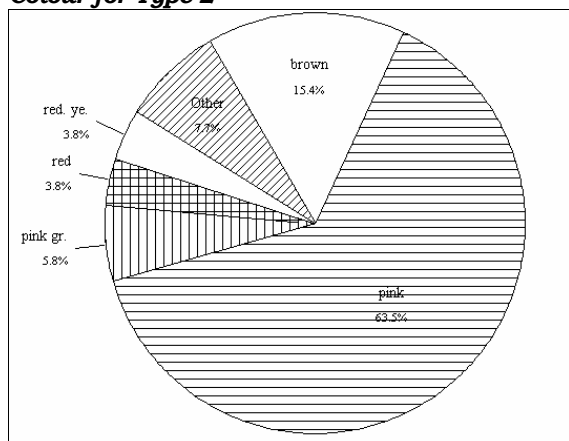
This type of jar had a globular body, out-turned pointed rims, very low neck, two ledge handles and a flat base (see Figure 5.1.30). Other rim variations include flat or flattened (13.5%), rounded (34.6%), and grooved (3.8%). One sherd occurred with a ring rim, typical for the pithos.

Only 52 forms belonged to this category forming 4.4% of the total jars. Around 87% of them came from Stratum IV, forming 6% of the pottery from this Stratum. The ratio between this type and the other types suggest that it is not typical for EBI pottery. However, the jar became a dominant one during the EBII period, and a similar form was found in Karem Jenin.

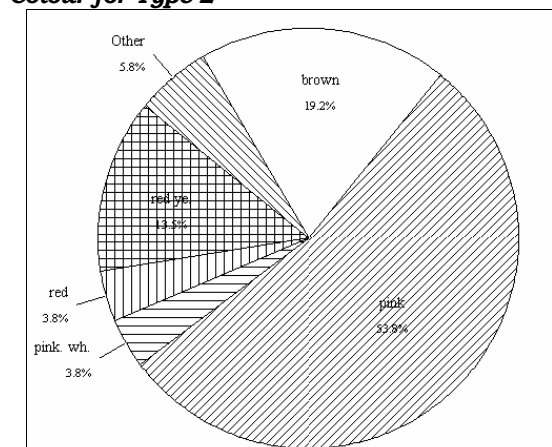
**Figure 6.1.4: Chart of Decoration Types for Type 1**



**Figure 6.2.1.1: Pie Chart of Interior Surface Colour for Type 2**



**Figure 6.2.1.2: Pie Chart of Exterior Surface Colour for Type 2**



### Colour

The clay colour of the fired neck jars is similar to that of the hole-mouth jar. However, it showed more pinkish variations than the previous type. *MSCC* shows the following variations (Figures 6.2.1.1, 6.2.2.2): brown (10YR7/3, 10YR8/4), pink (5YR7/4, 5YR8/4, 5YR8/4, 7/5YR7/4, 7/5YR8/4), pinkish grey (7/5YR7/2), red (25YR6/6/), reddish brown (5YR6/4), reddish brown (5YR6/4).

### Measurements

The jar's diameter ranges from 3 to 21 centimetres. The average rim diameter is 9 centimetres. About 10% of the neck jars come with a narrow opening (diameter of 3 to 5 centimetres). Only two sherds came with a large

opening, above 16 centimetres. The mean wall thickness for this type is 10 millimetres. It ranges from 4 to 20 millimetres. Only five (10%) sherds are above 15 millimetres thick; mainly found in Stratum III. The base diameter for the jars ranges from 9 to 10 centimetres. The average height is 33 centimetres

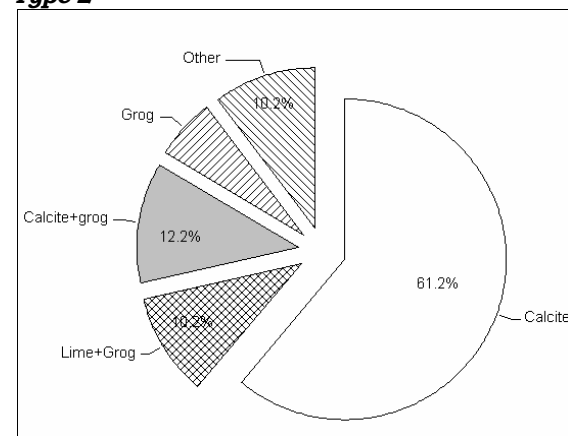
### The Clay and Tempering Agents

Nine samples of this type were subject to petrographic analysis. The results coincided with the macroscopic analysis. All samples show that the fabric is composed of mica, hematite and quartz. However, the majority of the clays with the exception of two samples, showed microfossils. These two samples show a higher percentage of the three other elements, while the clay with microfossils had fewer amounts of them. The jars are most likely made from local clay found in the Tell Jenin surroundings, probably Clay Types 1 and 2.

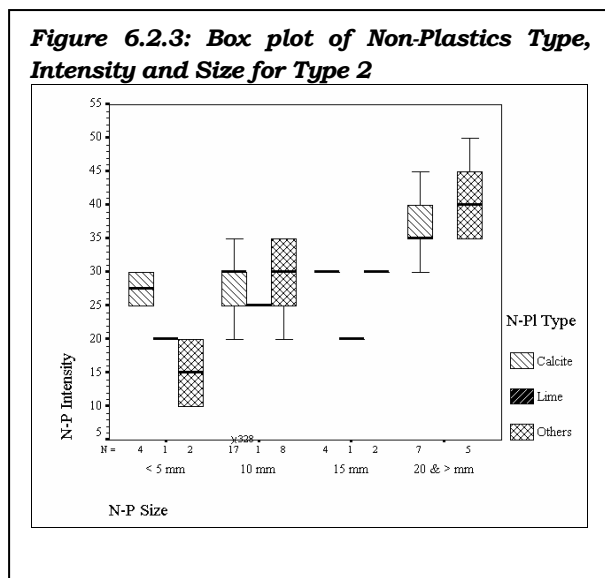
Both microscopic and macroscopic analysis shows that the main tempering agents are calcite, grog, mixture of wadi stones, lime, and hematite grits (Figure 6.2.2). Calcite is the major tempering agent for this type. Grog is also used, as well as lime. Few sherds included basalt.

The potters did not prefer one non-plastic size category above another. The three size categories had a similar non-plastics intensity distribution. The non-plastics occur with very fine size (0.5 millimetres), added in medium

**Figure 6.2.2: Pie Chart of N-Plastic Types for Type 2**



**Figure 6.2.3: Box plot of Non-Plastics Type, Intensity and Size for Type 2**



intensity (30%). It may indicate that the same proportion was measured for each size category. However, the potters tend to follow the general pattern of adding fine non-plastics in a moderate quantity (30%). Figure 6.2.3 shows that when fine and medium fine calcite is added to the pottery it is added in a range of 25 to 30%. When coarse calcite is used, it is added in a higher percentage. This is a more common way than the first. The most common practice regarding calcite is to add an average one-millimetre size calcite with a range of 25 to 30%. Adding lime as a non-plastic has shown a different behaviour. Very fine lime is added in very low intensity. Some occurs with fine size and medium intensity, and others with high intensity.

Grog (26.9%) is added in the same manner as the calcite. However, very fine grog is found to be added in a lower quantity than calcite. Thus, coarse grog is added in a larger amount. It is used dominantly with this type.

### Manufacturing Techniques

The majority of rims for this type were wheel finished. This is a common EBI finishing techniques. The body is built by the coiling method but it is possible that the neck and the rim were turned on the slow wheel.

The following is an attempt to describe these jars, the manufacturing method based on surface

markings analysis and with reference to the *hash* method used by the potters of Sinjil and Beit E'nan. It is more likely that the jars were built from more than five coils. One coil is used to build the base. Three coils to build the body, another coil to build the shoulders and the final coil to build the neck and rim.

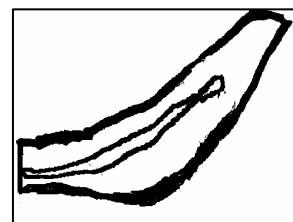
### Making the Base

A clay piece, most likely in a ball shape, is beaten and pressed with the palm on top of ash or fine gravel parting agents. Fingertip



presses are found on the interior surface. As a result, the base has a concave bottom, rising to about two centimetres high from the floor where it stands. This process is done to avoid direct contact between the base bottom and the floor surface.

Moreover, the base wall was raised to five centimetres. In several cases, another flat piece of clay was used. The result is a double wall, one on the exterior and the other on the interior. The connecting point is strengthened with another wall. After being fired a fracture of air bubbles can be traced for both walls. It is likely that a mould was used in the process of raising the edges. The base has irregular deep incision lines at the bottom and the walls are bent to the exterior at the point of attachment with the mould walls. The mould is one centimetre high. The base wall thickness is 7 millimetres where the body was attached but it is about 11 millimetres toward the bottom. This technique is followed as a solution to strengthen the weak base, since many bases were broken at this point.



There is evidence of using three coils in building the body, and a fourth may have been used for the lower part.

Evidence of irregular bending and a thin clay

layer is obvious between one coil and another. After the base was constructed, the interior bottom wall was smoothed and polished, probably with a piece of cloth. Then on this mould, a second coil was added to raise the wall. In the first stage, a coil was attached to the base raising the walls gradually. The connection point of those two coils is thicker than the rest of the wall. This thickness is a result of clay accessory added to connect both coils. This coil was added and smoothed on the base wall sides while the mould serves as a support. However, traces of fine concentric circles left by fingertips on the interior walls suggest that the final finishing of the base was done when the pot was revolving on a wheel. The process may involve also revolving the mould itself.

The wall is raised to about 5 centimetres. It is then smoothed with wet hands. Traces of fingertips and slurry are obvious at the point where the body joins the base.

The third coil raised the wall to the middle of the jar where the handles are joined. Traces of vertical lines suggest that the wall was thinned by cutting it with a stick. Fine lines of less than two millimetres thickness show the height of the third coil. Then the lines disappeared at the joint of the fourth coil.

The fourth coil is added to raise the wall until the middle of the shoulder (about 15 centimetres). It should be noted that the height of the previous coil was not even. In some places, it was three centimetres higher than at other points. It is clear that the coils can be placed vertically or horizontally and not necessarily at the length of the circumference.

The body surface is irregular suggesting that it was beaten by a paddle. Evidence of paddle cast is clear at some points.

The fifth coil is added to make the shoulder. The wall is thick from the bottom and becomes thinner toward the top. The shoulder slants gently.

The potter adds a final coil to build the neck

and rim. Evidence of fine fingertips circles is clear below the neck. The wall where the neck joined the body is thicker, around 14 millimetres. It becomes thinner toward the top (nine millimetres). It is more likely that this coil was turned on a wheel. Thick layers of slurry are evident at the attachment point of the two coils. The slurry is the result of wet palms used to join the coils. The fingertips smooth the point of attachment.

The neck was out-turned, ending with a pointed rim. The same coil that is used for the neck forms the rim tip. The forefinger and the thumb press the rim while the wheel is revolving.

A coil raised the rim and neck for less than one centimetre. Then, the rim was turned to the outside, which covers both sides of the



shoulder and so the shoulder was planted inside it. The result of this process is two ridges from inside and outside (because of a clay addition). The connection between the coils is also clear by a fine rope of clay, which is distinct from the upper coil. By adding this rope, the potter makes the connecting points thicker- 10 millimetres more than the wall- and so, it is much stronger. The neck and rim are turned on a wheel, evidence of regular fine lines of fingertips are clear. The rim is pulled up with two fingers to make it pointed and then it was turned out to make it flaring.

#### *Handle Attachment*

The pots had two typical indented ledge handles. The handles are attached vertically at the widest circumference of the jar, about 15 centimetres high. The handles are thickened to 16 centimetres wide and 26 centimetres long. Following professor Franken's proposition, the handles may be made as a round piece of clay, similar to a circular loaf of bread, and then cut into two halves. One-half was used to make the right handle and the other was to make the left



handle (Franken o.c).

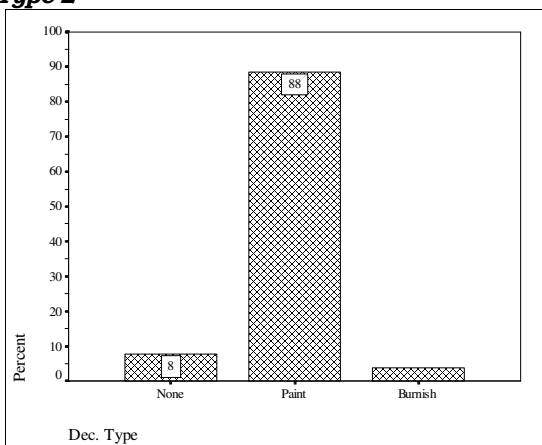
The wall is opened along the handle to insert it and then the handle is planted into the wall. The point of attachment was made wide by spreading clay accessories to strengthen the attachment. The point of attachment is 4.5 centimetres wide and 8.5 centimetres long. The width of the handle itself is three centimetres. The bottom of the handles is concave because of shrinkage. This side had also evidence of air bubbles. The wall bends from the inside, resulting from the pressure applied during the attachment. The extra clay penetrating to inside is bent in both sides. The result of this process is a flat clay rope of 2 centimetres wide and 21 centimetres long. The handles are then pressed to the body with the forefinger pressing the upper part and the thumb pressing the lower part. The connecting point is widened to strengthen the attachment with the body.

Handle attachment is done while the upper half of the pot is not finished, and when it is in the leather-hard stage. It is difficult to accomplish if the pot is completely dry.

#### *Decoration*

Three major surface treatments are applied (Figure 6.2.4). The majority of the neck jars were decorated with red slip paint. Some of the painted jars were decorated with line painting. Few of them were not decorated (8%). Some sherds were treated with slip burnish.

**Figure 6.2.4: Chart of Decoration Types for Type 2**



One complete form was found which was decorated with rope and slip. The body of the pot was slip coated with the same clay slurry. It was applied to the interior and the exterior surfaces alike. The slip was then smoothed with a stick. Two thin clay ropes (eight millimetres thick) were attached. They were pressed or indented with a tool and fingernails. The first rope was added around the shoulder (four centimetres below the rim). The second rope was placed on the belly (15 centimetres below the first) at the point where the handles attached to the body making a straight line around it.

Some jars were decorated with a light red slip paint (2.5 Y 6/8), covering the exterior surface. At some points, the slip was thicker. The slip accidentally drops down the neck interior surface. It may be that a piece of cloth is used to coat the jar surface. Other slip 'splashes' are obvious inside the body.

#### *Firing*

The neck jars show a well-fired core. The sherd core is divided between yellow, red and grey cores. Red and yellow cores indicate high firing. It is more likely that the firing was done in the kiln. Almost 60% had no carbon core. The grey core indicates that the firing was low, and it was more likely done in the open. At some spots, the core orientation was to the inside, and so it indicates that the firing was higher at the outside.

On the exterior surface and at the shoulder some sherds show remains of dark grey spots. These spots usually resulted from the use of green organic materials as fuel. The fired pots from Y'abad had similar markings.

#### **4.2.3 Type 3 Pithoi (Figure 5.1.43)**

##### *Description*

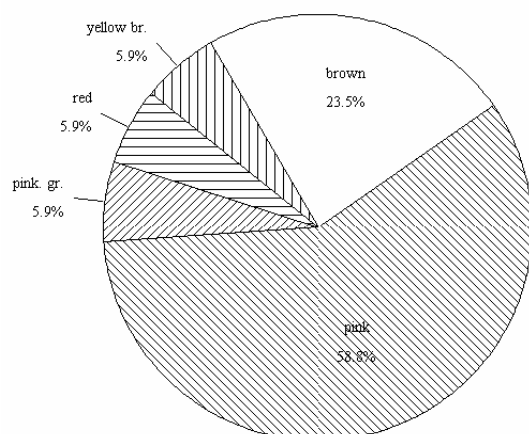
The pithos is a class of large necked jars with thick heavy walls. It is likely that this type was used for storage. Only 17 forms were recorded. One form was half-complete. It had a straight body and a wide flat base (Figure 5.1.43). More pithoi are to be found in Stratum III. Three rim

types are common with this form: (1) Flat rims (3%), (2) Rounded rims are the typical (47%) (3) and the Ring rim (18%). The neck is usually straight. In certain cases, the pithoi occurred with thickened profile rims. Most likely that the pithoi were handleless.

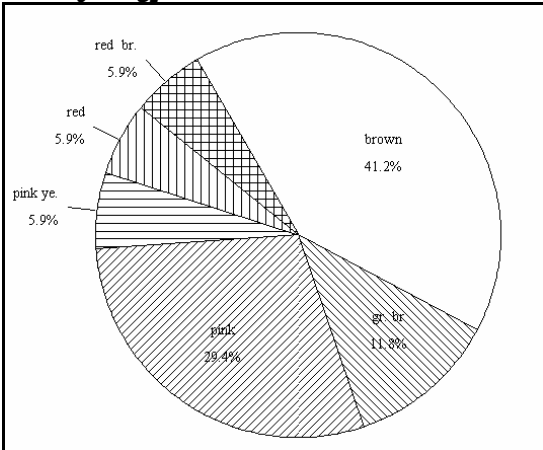
#### Colour

The exterior and interior surface colour variations are noticed, in the range between the brown and the pink colours. The fired clay colour is darker than the previous types. MSCC showed the following variations (Figures 6.3.1.1, 6.3.1.2.): Brown (10YR7/3, 10YR8/3), pink (5YR7/4), greyish brown (10YR5/2), red (10R6/8/), pinkish grey (7/5YR7/2).

**Figure 6.3.1.2: Pies Chart of Exterior Surface Colour for Type 3**



**Figure 6.3.1.1: Pies Chart of Interior Surface Colour for Type 3**



#### Measurements

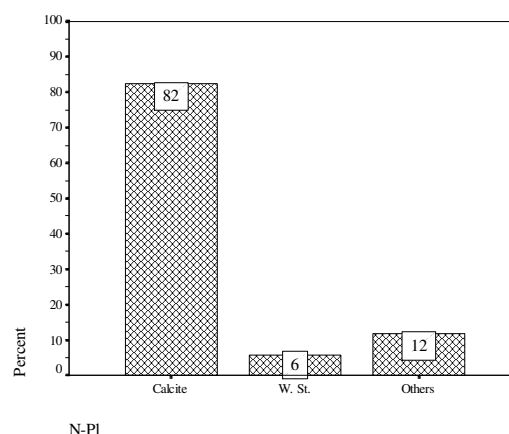
The pithos occurs with large diameters and thick walls. The diameter ranges from 7 to 13 centimetres. The average diameter is 10 centimetres. They show a high uniformity with a standard deviation of 1.55. The wall thickness ranges from 10 to 22 millimetres, with an average thickness of 16 millimetres.

#### Clay and Non-Plastics Agents

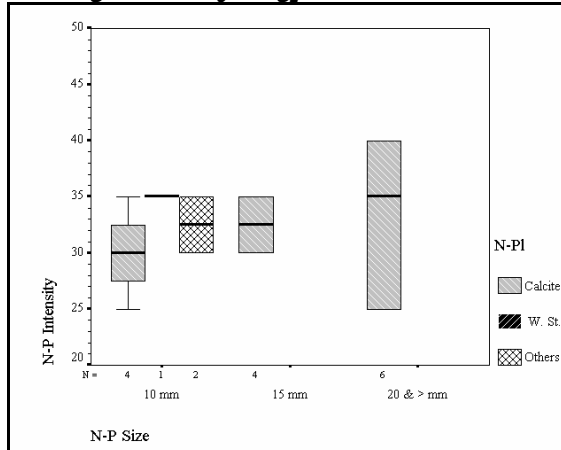
Almost all sherds are tempered with calcite (Figure 6.3.2). Only 18% of the sherds had other inclusions (including a mixture of wadi stones, grog or lime).

Figure 6.3.3 shows that fine calcite is added in a fair quantity, around 30%, while coarse calcite is added in a larger quantity of around 35 to 40%.

**Figure 6.3.2: N-Plastics Types for Type 3**



**Figure 6.3.3: Box plot of Non-Plastics Type, Intensity and Size for Type 3**



In addition, Figure 6.3.3 indicates that the three sizes are added in a similar quantity. However low and high quantities are added in coarse non-plastics. Medium sizes with medium intensity. Above 35% is the highest. Because of thick walls, non-plastics were needed to save clay and improve its workability.

#### *Manufacturing Method*

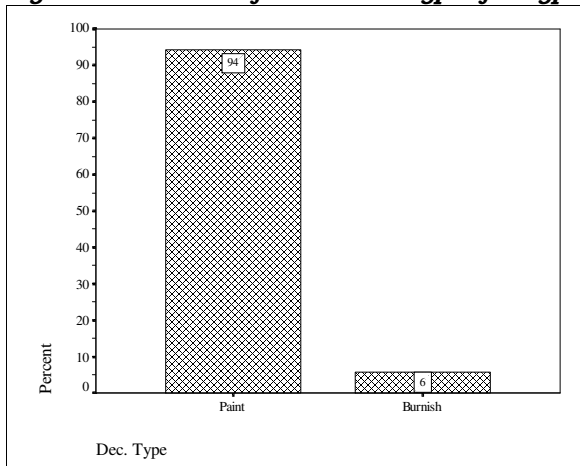
Most likely the pithos is made by the coiling method, using both wheel and hand finishing. There was no complete form to reconstruct this process. The lower part of an incomplete form had an eroded surface, which is very difficult to read. However, the wall thickness variations and irregularity of the surface indicate that the coiling method was used, similar to the one above. The base is similar to the previous one where evidence of fractures at the joining points is noticed. The pithos rim was turned on a slow wheel. They were probably folded before they were smoothed by the fingers.

The pithos firing was high, since a few of the sherds show evidence of grey coring. The thick walls required more heat to reach a full firing, which was most likely done in the kiln.

#### *Surface Treatment*

Like the neck jars, none of the pithoi had incisions over the shoulder. The majority (94%) were heavily coated with the common red slip paint. One sherd showed evidence of polishing and light burnishing.

**Figure 6.3.4: Chart of Decoration Types for Type 3**



#### 4.2.4 **Type 4: Jugs and Juglets** (Figure 5.2.1-5.2.5)

The majority of these sherds were found in Stratum IV. One third was from Stratum III. This type could be divided into three sub-types. The common sub-type is the jug with a flared rim and narrow neck. Some rims were bent to the outside making the opening wider than the neck (Figure 5.2.5).

The second type is the short-neck jug. It occurs with a globular body and a flat base, with or without two small loop handles or pierced lug. Some of these had a spout (Figure 5.2.1).

The third type occurs with a wide neck and a high loop handle. Often this type occurs with red burnish decoration. A corpus of these jugs was found in a tomb close to Tell Jenin, and excavated by the Palestinian Department of Antiquities.

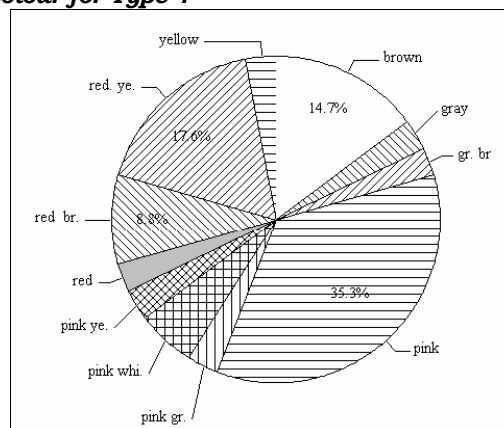
In general, the jugs occur with three major rim types. The typical one is the pointed rim (60%), then the rounded rims, and two sherds only had flat or flattened rims.

Two complete forms were found, both belonging to the low-neck type.

#### *Colour*

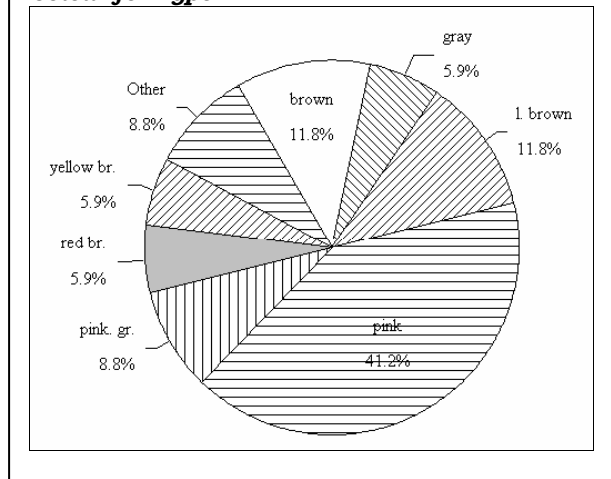
Again, the common colour pattern is with the brown and pink colours. This type shows more colour variations than the other types. *MSCC*

**Figure 6.4.1.1: Pie Chart of Interior Surface Colour for Type 4**



variations are (Figures 6.4.1.1, 6.4.1.2): Pink (5YR7/6/, 5YR7/4), brown (10YR7/3, 10YR7/4), yellowish brown (10YR6/4), pinkish white (5YR8/2), reddish brown (5YR6/3, 25YR7/4, 5YR7/4), pinkish grey (7/5YR6/2, 7/5YR7/2), reddish brown (25YR7/4), light brown (7/5YR7/4), reddish yellow (5YR6/8/, 5YR6/6/), grey (5YR6/1, 5YR5/1).

**Figure 6.4.1.2: Pie Chart of Exterior Surface Colour for Type 4**



#### Measurements

The jugs usually occur with a very narrow opening and thin walls. The diameter ranges from 2 to 17 centimetres. The average diameter is six centimetres. One sherd is 17 centimetres wide, found in a Stratum III context. This also had a thick wall of 14 millimetres. The walls are ranging from 4 to 14 millimetres and an average of 8 millimetres. The jug height is about 15 centimetres. The base diameter ranges between 3 and 7 centimetres.

#### Clay and Non-Plastics Agents

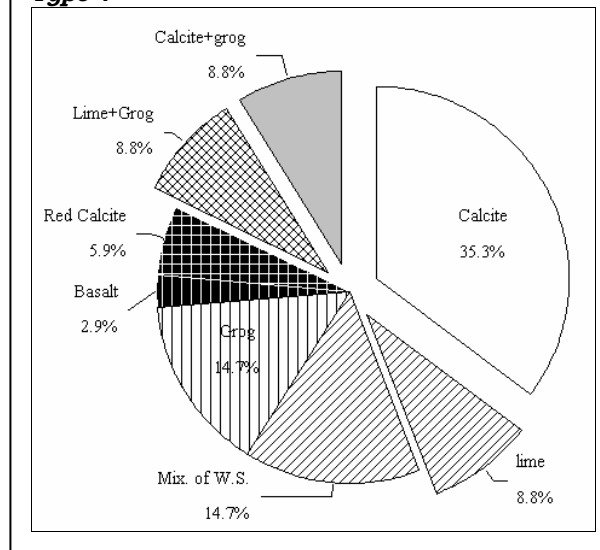
Thin section analysis shows that the jugs are made from Type 2 clay. Another sample shows a mixture of Type 1 and Type 2 clay with a domination of Type 1. All the samples had microfossils and hematite inclusions. Macroscopic analysis shows that the forms are made from well-sieved fine clay.

Many sherds are tempered with calcite (41%). However, it was noticed that the potters added

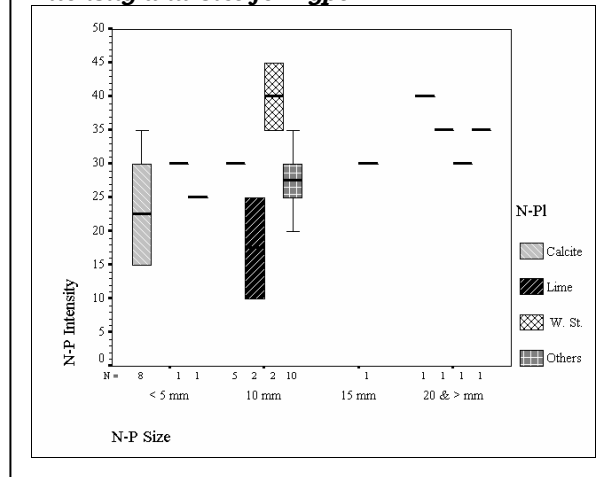
grog to one third of the jugs. It is with fine size and low intensity. Mixture of wadi stones, lime and basalt are also added or included in the fabric of this type (Figure 6.4.2).

Very fine calcite is added in 15 to 30%, an average of 25%. Lime and mixture of wadi stones are found with a larger size and a lower intensity. Grog is added in fine size and medium quantity to about 30% (Figure 6.4.3).

**Figure 6.4.2: Pie Chart of N-Plastic Types for Type 4**



**Figure 6.4.3: Box plot of Non-Plastics Type, Intensity and Size for Type 4**



#### Manufacturing Method

Based on a complete form, the interior jug surface was severely eroded and had attrition all over which erased the markings for the final manufacturing process. However, there is a clear

marking on the exterior and the interior surfaces to support the idea that the jug was finished on the wheel. The best indication is found at the base bottom surface. It is clear by fine lines of concentric circles that the base was cut by a string. The wheel was slowly revolving. It is also possible that the base was cut while the wheel was not revolving, since string cutting left traces of fine straight lines (see Figure 5.2.1). Since evidence of a double wall is clear, the base may have been made from a separate clay coil, evidently it was the first to be put on the wheel before it was cut from a large hump. Many of these jugs are made this way by Abu Ahmad the potter of Jaba' in Jenin.

Therefore, it seems as if the jug was made from five coils or perhaps two stages, if the wheel was used. One coil is for the base, two for the body, another for making the shoulder and one for shaping the neck and rim. Circular lines of fine fingerprints are shown below the slip. The rim and the neck showed evidence of fine lines remaining from the fingertips. Obviously, the coils were added while the wheel is revolving. It is of a slow wheel type. The rim is made to a pointed tip, probably by holding the clay between the forefinger and the middle finger.

Two small lug handles were attached at the upper part of the shoulder. They were made oval in section. The point of attachment is 2.5 centimetres long and 1.5 centimetres wide. The handle thickness is eight millimetres and is three

centimetres long. They were vertically laid to the shoulder. The spout is circular and two centimetres in diameter. It is placed on the middle of the shoulder between the two handles.

The jugs are well fired. The amount of the sherds with grey carbon cores are less than those with red or yellow cores (74%). This indicates that the firing was done in a kiln. The majority of sherds had a hard surface, which is a result of the firing. Some soft surfaces occur in Stratum III.

#### *Surface Treatment*

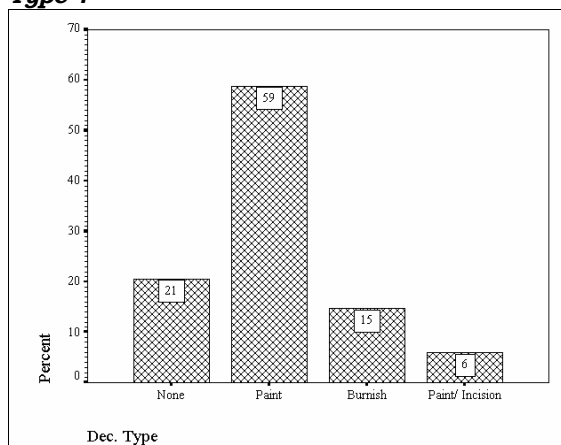
The common surface treatment for this type is to paint the surface with brown slip (2.5 Y 5/4 reddish brown). Around 21% of the sherds were not decorated. Few sherds were painted with line painting (10%).

Around 15% occur with red burnish decoration. The common is the drab red burnish. Few were incised with dots or fine lines together with applying the red paint (Figure 6.4.4).

#### *Open Forms*

The open forms were found more in Stratum III than Stratum IV. They are divided into four three types, bowls, small bowls, goblets and kraters. Some of the small bowls showed evidence of edge burning, which suggest that they may have been used as lamps. However, their shape and general technology does not differ from the rest of the bowls. Plates are included within the bowls, since few of them were recovered.

**Figure 6.4.4: Chart of Decoration Types for Type 4**



#### **4.2.5 Type 5: Bowls (Figure 5.3.1-53.10)**

##### *Description and Sub Types*

This type denotes a class of large deep bowls, among which height exceeds their diameter. It is the most dominant type within the open forms. Bowls are the second dominant type for the EBI after the hole-mouth jar. It is dominant in Stratum III, but more dominant in Stratum IV (Table 4.1), which make it one of the popular types.

This type is usually handleless. Some forms

occur with knob or lug handles placed at the upper part. Rims can be flat, pointed or grooved. Rounded and ridged rims are the least common. The form occurs also with five sub-types:

*Sub-type 5.1* includes straight-sided bowls, which are more likely belonged to the V- Shaped bowls. The rim is simple, meaning, levelled with the wall. (See Figure 5.3.1-5.3.3)

They represent 34% of this type, 80% of them are in Stratum III.

*Sub-type 5.2* is a class of bowls with profiled and ridged thickened rims. The rim is usually triangular. It may have been shaped to prevent liquids from pouring aside. However, this class is found only with 10% of the forms.

*Sub-type 5.3* is a class of bowls with in-curved rims (Figure 5.3.8- 5.3.10). The rim is intentionally incurving to hold the liquids. This incurved rim bowl became dominant during the EBII period. However, the EBII classes are different by having some sherds treated with the burnish slip and others with the combination of net pattern incision lines and paint slip. In EBI Tell Jenin, the surface treatment is mainly done by smoothing a slip of the same clay slurry that was used in manufacturing them. They are found with 18% of the sherds,

*Sub-type 5.4* is a class of bowls with in-cut rims (Figure 5.3.6). The rim slants to the inside and probably is cut by a knife or the fingertips to make it. Some of these rims occur with a combination of incision dashes and red slip paint. However, the dashes are thinner and less dense than those applied to the hole-mouth jars. They are represented only by 1%.

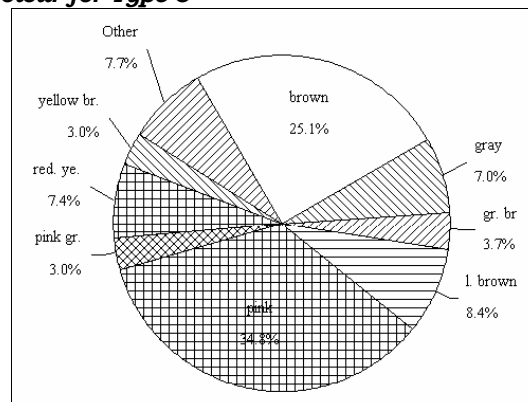
*Sub-type 5.5* is a class of bowls with round walls or slightly slanting sides (Figure 5.3.4-5.3.7). It was one of the largest bowl classes, represented by 37%. More than 80% of them are in Stratum IV. This sub-type included also hemispherical bowls, which comprises only 2%, of the bowls type.

#### Colour

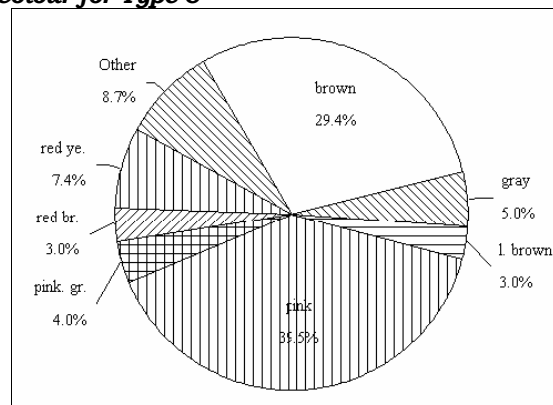
The bowls show similar colour variations to that of the closed forms. However, it had a more

tendency toward lighter colours. *MSCC* showed a variability of the brown, light brown and pinkish colours (Figure 6.5.1.1., 6.4.1.2.): Brown (10YR5/3, 10YR6/3, 10YR7/3, 10YR7/4, 10YR8/3, 10YR8/4, 5YR7/3), light brown (7/5YR6/4), grey (10YR5/1, 10YR7/2), greyish brown (10YR5/2, 10YR6/2), pink (5YR7/4, 5YR7/6, 5YR8/4, 7/5YR7/4, 7/5YR8/4), pinkish grey (7/5YR6/2, 7/5YR7/2), pinkish yellow (5YR7/8), red (25YR7/2), reddish brown (5YR6/4), reddish yellow (5YR6/6, 5YR5/6, 7/5YR7/6, 7/5YR8/6), yellow (25Y7/4, 10YR8/6) , reddish yellow (7/5YR8/6, 7/5YR7/6).

**Figure 6.5.1.1: Pies Chart of Interior Surface Colour for Type 5**



**Figure 6.5.1.2: Pies Chart of Exterior Surface Colour for Type 5**



#### Measurements

The bowls had a large diameter. The diameter ranges from 4 to 27 centimetres. The average diameter is 11 centimetres. Wall thickness ranges from 5 to 35 millimetres. The average is

12 centimetres. Only one sherd is 35 millimetres wide. Most thick walls resulted from hand made techniques.

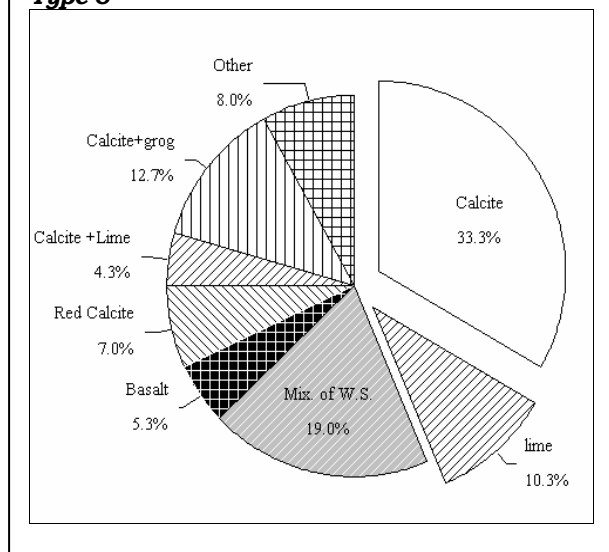
#### *Clay and Non-Plastics Agents*

The majority of bowls are made with coarse fabric. Very fine fabric was used in the later stratum, with the burnished bowls.

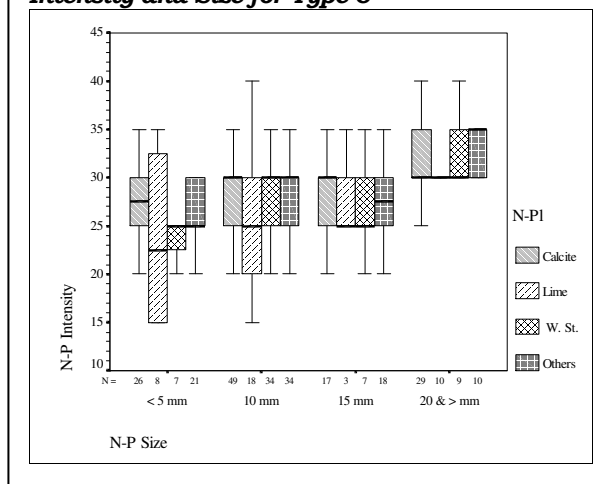
Thin section analysis showed that mixing two or more of the four clay types known in Jenin zone make the majority of bowls. Few sherds are made out of one type only, especially Clay type 1 composed of hematite, mica and quartz, or Type 2 clay composed microfossils and no quartz. The dominant tempering agents are grog and lime. One sherd shows gabbro only as a tempering agent. This sherd had microfossils and sub-shells inclusions.

Both microscopic and macroscopic analyses show that calcite is the major tempering agent (40%). Other non-plastics include grog (16%); 13% was mixed with calcite while grog alone comes from Stratum IV. Flint (2%) was found in Stratum III. The sherds also had microfossils (2.7%), basalt (5.30%), mixture of wadi stones (19%) and lime (11%) (Figure 6.5.2). One sherd included quartz. Non-plastics size ranges from 0.5 to 3.5 millimetres. The average is one millimetre. Very few sherds were tempered with large size. So, there was a preference of small

**Figure 6.5.2: Pie Chart of N-Plastic Types for Type 5**



**Figure 6.5.3: Box plot of Non-Plastics Type, Intensity and Size for Type 5**



size between 5 to 10 millimetres (45%) and 2 to 5 millimetres (21.3%).

The non-plastics intensity ranges from 10% to 45%. Most sherds are tempered with low and medium intensity. Very low and high tempering intensity are less found, while 25-30% is the most common.

The dominant combination (49 cases or 16%) is the calcite added in fine sizes and a moderate intensity between 25 and 30% (Figure 6.5.3). Next, the wadi stones and other non-plastics types with the same intensity and size occur with 11% each. Calcite with large size and higher intensity is found with 10%, but still the range is around 30%. Lime had also a different behaviour, where most of the cases occur with lower intensity but similar size to the other ones. This may be another clue that the lime was included in the clay content while the other non-plastics were added.

#### *Manufacturing Method*

The traces on the surface show that one third of this type was hand finished, mainly in Stratum III. There are no complete forms with which to reconstruct the bowls' manufacturing method. It can be concluded that the bowls are wheelmade or formed by the coiling method.

Wheelmade forms are formed from a coil or a clay ball placed on top of a wheel disk. It may be the case that some of these bowls are placed on a

mould, in which the clay ball was pressed. The bowls' upper body was shaped by pulling up the sides of the open clay ball. Some walls had irregular thickness and bandings, suggesting that they were made by pressing a clay coil or a slap.

The rims were made by pulling out the clay between the two fingers. Some rims were even, and others were not. Those which had circular circumference were finished on the wheel. Those that had irregular one were finished by hand, since it is difficult to make a circular rim by hand. In both cases, the simple round or pointed rims are finished by pulling the clay between the two fingers. The flat rim is made by a tool. It is likely that the potter shaved the extra clay when making thin rims.

The knob or lug handles were attached to the upper part of the shoulder. Evidence of fracture existed in the handle attachments, because of shrinkage. Some forms occur with pierced lug handles, to be attached to a string. Other forms occur with one or more horns below the rims. Both the knob and horn may be pulled out between the thumb and the middle fingers and the forefinger. These are most likely served as decorative accessories rather than handles.

The base is cut by one of two means: one is the string cut base and the other is the flat base. It is likely that the flat base was first made thick before the extra clay was trimmed. The base attachment is a critical joint and it needs to be

made thicker to hold well. The extra clay is shaved or smoothed. In some cases, evidence of a sharp tool was clear. Other cases show evidence of cloth and polishing.

The pot was fired in the open because the grey cores are the dominant ones. There is a higher percentage of medium hard and soft pottery than other types. Other sherds with red and yellow cores no doubt had a high firing.

#### *Surface Treatment*

More than half occurred with red paint (Figure 6.5.4). The bowls comprised one quarter of the non-decorated forms; 20% were not decorated. The majority of the decorated sherds are from Stratum III. This actually denotes one quarter of this stratum. Although slip alone is not common (4%), it occurs in Stratum III, as does burnish alone. The line painting is also typical for Stratum III. Some forms had a paint line below the rim on both the inside and outside. Incision is typical for Stratum IV, so is the burnished slip and paint slip. The incision is formed either by fine dots, or by notches similar to that of the hole-mouth jars.

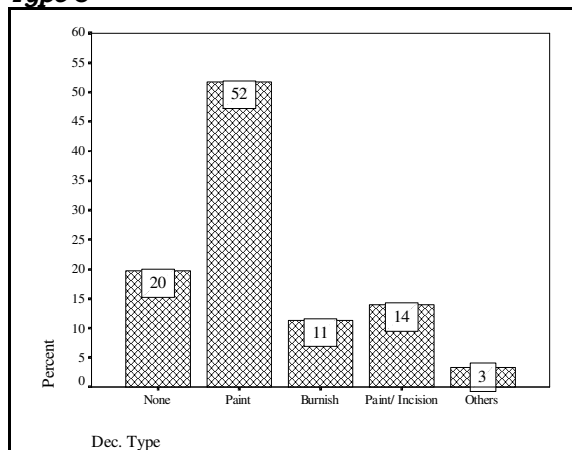
#### 4.2.6 **Type 6: Small Bowls or Cups** (Figure 5.3.11-5.3.19)

This type denotes a class of very small bowls that had a very thin rounded wall and a height not exceeding five centimetres. It is found in both Strata, but a little more in Stratum III. The majority of the forms come with pointed simple rims. Others come with rounded, flat and few with finely grooved rims. One third shows that the rim was straight, though typically it is in-turned. The body is mainly globular (28.4%). Straight and rounded bodies come chiefly from Stratum III. Hemispherical shapes (23.5%) are typical for Stratum IV.

#### *Colour*

As the previous type, the small bowls show a tendency toward lighter colours. *MSCC* variations of the pink and brown are minor. They are still the most dominant colours. It shows the following variations (Figure 6.6.1.1, 6.6.1.2): pink

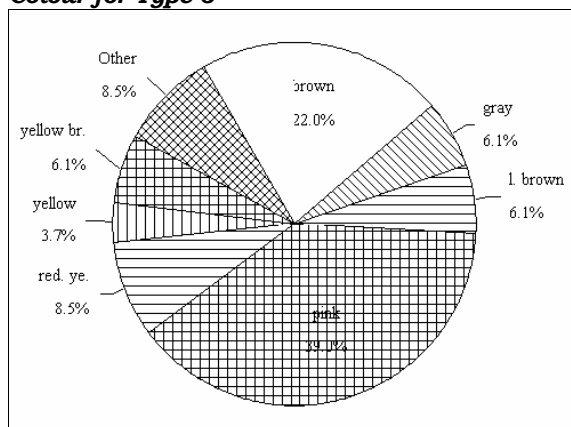
**Figure 6.5.4: Chart of Decoration Types for Type 5**



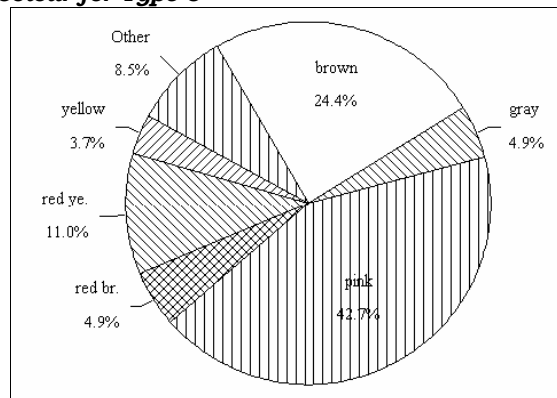


(5YR7/4, 5YR7/3, 5YR7/6/, 7/5YR7/4, 7/5YR8/4), reddish yellow (5YR6/6/, 7/5YR8/6/), brown (10YR7/3, 10YR7/4, 10YR8/4, 7/5YR5/4), grey (10YR31, 25Y7/2, 5YR41), light brown (7/5YR6/4), greyish brown (10YR6/2), pale olive (5Y6/3), yellow (25Y7/6/, 25Y8/2, 25Y8/4), yellowish brown (10YR6/4).

**Figure 6.6.1.1: Pie Chart of Interior Surface Colour for Type 6**



**Figure 6.6.1.2: Pie Chart of Exterior Surface Colour for Type 6**



### Measurements

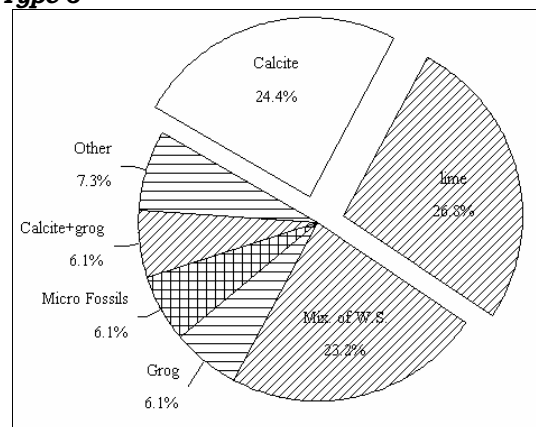
The diameter ranges from 3 to 21 centimetres, with an average of 10 centimetres. Wall thickness ranges from 4 to 14 millimetres with an average thickness of 9 millimetres. Larger diameters and thicker walls are found in Stratum III, smaller ones in Stratum IV. Both qualities are associated with hand made forms, suggesting that this type is made by coiling.

### Clay and Non-Plastics

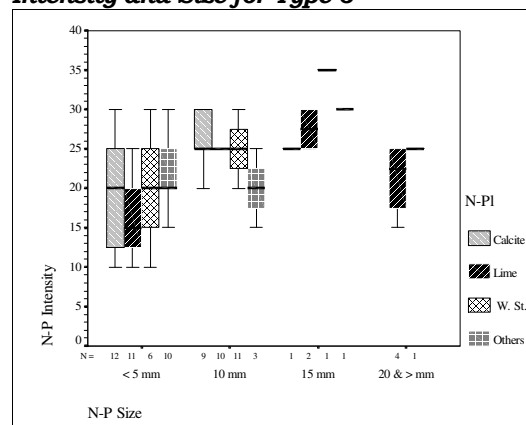
The over all fabric is characterized by a fine matrix. It resembles in a great way the bowls fabric matrix. Calcite (28%) and lime (29%) were both found. Mixture of wadi stones is found with 23% of the samples, mainly in Stratum III. Other inclusions are grog (11%), microfossils (6%), and flint and Basalt with one sherd each (Figure 6.6.2). Non-plastics sizes range from 0.5 to 2.5 millimetres, with an average of one millimetre. The Non-plastic intensity ranges between 5% and 35%, with an average of 20%.

Figure 6.6.3 shows that the common occurrences of calcite are with few intensity and very fine sizes. It occurs also with medium intensity. Lime occurs with low intensity and very fine sizes.

**Figure 6.6.2: Pie Chart of N-Plastic Types for Type 6**



**Figure 6.6.3: Box plot of Non-Plastics Type, Intensity and Size for Type 6**



### Manufacturing Method

The manufacturing method of this type is simple. The majority of tiny bowls is made by hand. Because of their small size, it is likely that the clay was pressed into a small mould and then shaped to thin walls. The wheelmade ones are made from a clay hump. The rim is shaped to a point or completely rounded. The string cut and pulled out bases indicate that this form was made made on the wheel. The pulled out base was either left as it was, or pressed to a flat surface. Alternatively, it was cut from the hump when it is thick and trimmed by a tool.

Few sherds had grey core. The majority of cores were completely fired. This is because most of the cups come with thin walls, which allow the heat to penetrate easily through the walls. It is possible also that a kiln was used in the firing process.

### Surface Treatment

The surface is usually not decorated (28%). If it is, then burnishing is the most common method (36%). The red slip burnish (26%) is a very typical surface treatment this type. The rest of the sherds are treated with slip or paint. Very few sherds occur with a line painting below the rim. Some sherds had dot incision combined with the burnishing or painting (Figure 6.6.4). The preference to burnish is related to the function of these bowls, where it is often applied

to forms that are used for liquids.

### 4.2.7 Type 7: Goblets (Figure 5.3.20-5)

The goblet is a common class of open forms in which height exceeds its diameter. Goblets are the most dominant type within the entire collection (311 rims or 28%). They are mainly a type common to Stratum III (67%). The goblets are of two sub-types:

*Sub-Type 1* is comprised of straight rim Goblets (Figure 5.3.20- 5.3.25) characterized by straight walls, a simple rounded rim and a flattened base. It is the most dominant between the two sub types (64%). Mainly, it is the type for Stratum III.

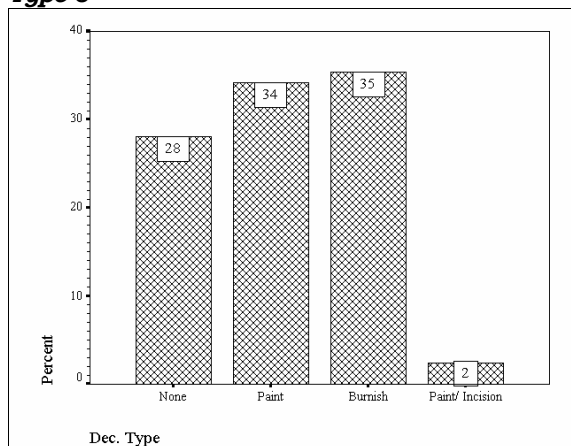
*Sub-Type 2* is a class of goblets with out-turned rims and necks (Figure 5.3.26-5.3.31). A carinated body distinguishes the shape of this class. This sub- type was found with 36% of the goblets. It is mainly from Stratum IV.

The goblets rims are usually pointed to a tip (47%) or rounded (36%), but uncommon types like flat and ridged rims also occurred.

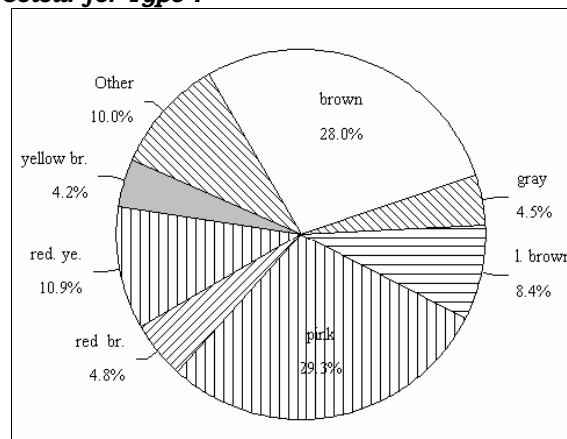
### Colour

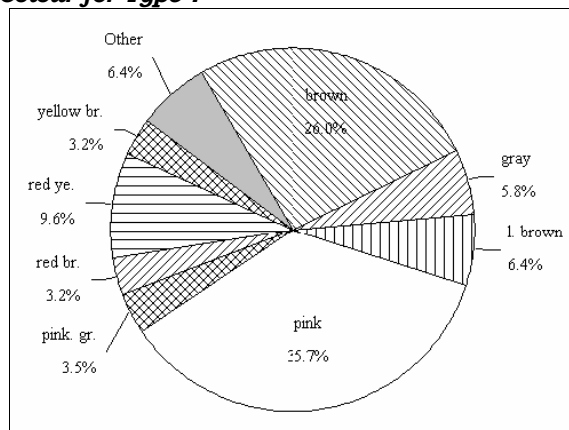
The goblets tended to colours similar to the bowls. The fired clay colour range is light. *MSCC* showed that the variations between the brown and the pink colours are minor. These

**Figure 6.6.4: Chart of Decoration Types for Type 6**



**Figure 6.7.1.1: Pie Chart of Interior Surface Colour for Type 7**



**Figure 6.7.1.2: Pie Chart of Exterior Surface Colour for Type 7**

variations are (Figure 6.7.1.1., 6.7.1.2.): Brown (7/5YR44, 10YR6/3, 10YR7/3, 10YR7/4, 10YR8/2, 10YR8/3, 5YR7/3, 7/5YR5/4), grey (10YR5/1, 10YR7/2), greyish brown (10YR42), light brown (7/5YR6/4), pink (5YR7/4, 5YR7/6, 5YR8/4, 7/5YR7/4, 7/5YR8/4), pinkish grey (5YR7/2, 7/5YR7/2), pinkish white (7/5YR8/2), pink (5YR7/3), reddish brown (5YR5/3, 5YR6/3), reddish yellow (5YR6/6, 7/5YR6/6), reddish brown (25YR6/4), reddish brown (5YR6/3), yellowish brown (10YR6/4), greyish brown (10YR6/2), white (10YR7/1).

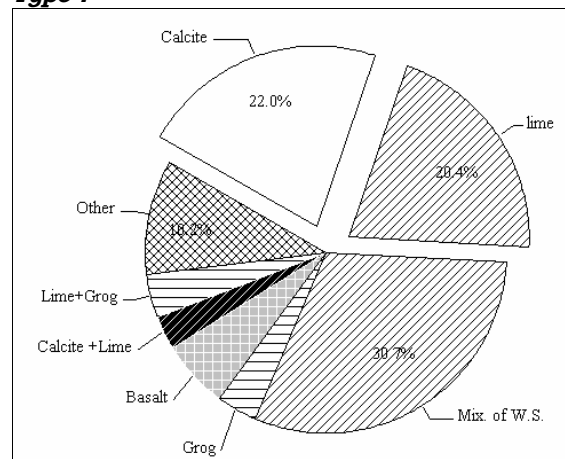
#### Measurements

Goblet diameter ranges from 3 to 20 centimetres with an average of 8 centimetres, one of the smallest for the entire collection. The large diameters are found in Stratum IV. The walls were thin. The thickness ranges from 2 to 16 millimetres, with an average thickness of 9 millimetres.

#### Clay and Non-Plastics

The majority of the forms had a coarse fabric, mainly those from Stratum III. The very fine fabric came from Stratum IV.

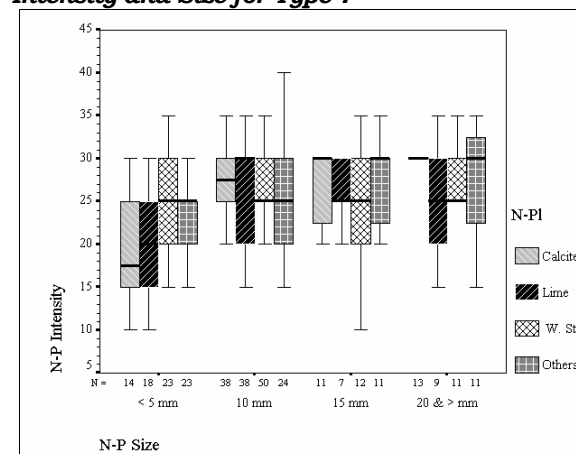
Thin section analysis shows that the goblets are made from two clay types, microfossil (Type 2) and Mica/Quartz (Type 1). One sherd shows a mixture of the two types. It was tempered with calcite, grog, lime, hematite and basalt. Figure 6.7.2 indicates that the major non-plastics agent

**Figure 6.7.2: Pie Chart of N-Plastic Types for Type 7**

for this group is a mixture of wadi stones (31%), followed by calcite and lime. Calcite is mainly used in Stratum IV. Grog is also found as a tempering agent. A very few sherds included quartz, microfossils and flints as well as organic materials, mainly from Stratum III.

Non-plastics ranged in size from 0.5 to 3.5 millimetres, and had an average of one millimetre. Non-plastics intensity ranged from 5% to 45% with an average of 25%. This is one of the lowest percentages of non-plastics intensity.

Figure 6.7.3 shows that a mixture of wadi stones are often used with fine size (one millimetre) and medium intensity, ranging from 25% to 30%. It shows non-plastics behaviour different from others. Very fine calcite is found

**Figure 6.7.3: Box plot of Non-Plastics Type, Intensity and Size for Type 7**

with less intensity, and for the larger sizes it was tempered the same way, around 30%. Lime shows a slightly different pattern. The majority of the lime was added in a similar intensity, around 30%. About 60% are tempered at low and very low intensity.

#### *Manufacturing Method*

About half of the forms are wheel finished (56%). Hand finish and combination of both techniques are typical to Stratum III. It is a common case that necked goblets are hand made while those with out-turned rim are wheel-made. No complete form of any of these subtypes was found. However, it is more likely that the goblets are made in a process similar to that of the bowls. Because of their small size, they are made from a clay lump, and had cut and pulled up bases. For the hand made ones, it is possible that they are made from a small clay ball, raising the walls from a single coil. The wall was raised by pressing the clay between the palms. At the same time, the walls are smoothed, more likely by a piece of cloth. Some were smoothed and polished with a tool, probably during shaving the walls to make them thin.

#### *Surface Treatment*

Painted, burnished and non-decorated goblets show almost an even distribution for this type (Figure 6.7.4). One third of the non-decorated

forms are mainly from Stratum III.

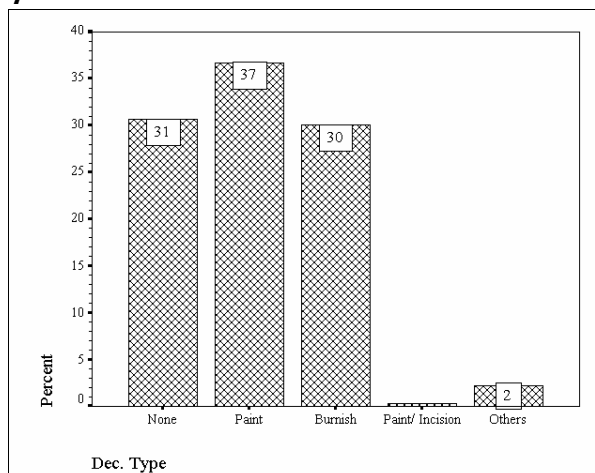
Burnish slip and burnish alone occur with 22% of the sherds, mostly from Stratum IV. Painting was applied to 37%. Of those, 13% belongs to the decorative style of a horizontal red line below the rim. This line can also cover the rim interior side. The remaining sherds were slip painted on the whole surface. Burnishing was applied to 30% of the sherds. It is mainly direct burnish, but burnish slip was applied to 13% only. The combination of paint and incision is also found on less than one percent of the forms. The incision consists of either fine dots or fine continuous lines below the rim.

#### 4.2.8 Type 8: The Grey Burnished Tradition

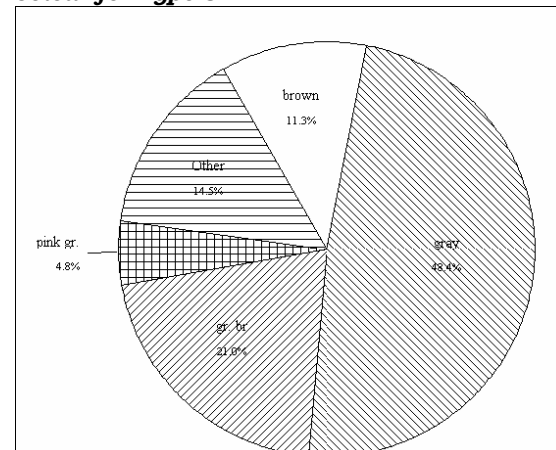
The Grey Burnished tradition is one of the EBI pottery hallmarks (Figure 5.3.32). It is a tradition restricted to sites in North Palestine (with one exceptional find in Tlul Abu el Alaiq). This tradition had its roots in the Chalcolithic period. Sixty-two sherds only were found in Tell Jenin (5.2% of the total). They are equally represented in both strata (Table 4.1). They represent 6.4% of the sherds found in Stratum III and 4.4% for the sherds of Stratum IV.

Besides the grey burnished surface treatment, the common form is the S shape, which occurs with both the close and the open forms. The

**Figure 6.7.4: Chart of Decoration Types for Type 7**



**Figure 6.8.1.1: Pie Chart of Interior Surface Colour for Type 8**



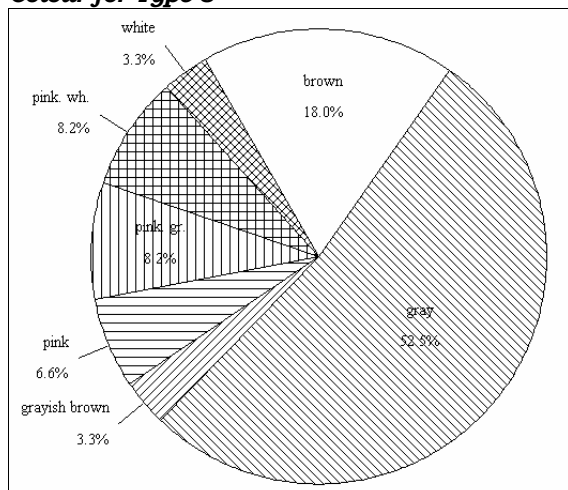
majority of forms majority are bowls with S shape. Globular forms are also found in Stratum III; a few others have straight forms.

The rim shapes vary also. The majority are rounded with out turned shape. Pointed rims are also common, but flat and flattened rims less so.

### Colour

Although the grey burnish is grey in colour, some grey-coated sherds had different sub surface and interior colours. *MSCC* reading shows that grey variation is the dominant colour, along other colours (Figures 6.8.1.1., 6.8.1.2.): Grey (10YR41, 10YR6/2, 10YR6/1, 10YR7/1, 10YR7/2) greyish brown (10YR5/2), pink (7/5YR8/4), brown (10YR6/3, 10YR7/3), white (10YR7/1).

**Figure 6.8.1.2: Pie Chart of Exterior Surface Colour for Type 8**



### Measurements

The diameter ranges from 3 to 21 centimetres, with an average of 11 centimetres. The wall thickness varies from 4 to 14 millimetres, with an average of 9 millimetres.

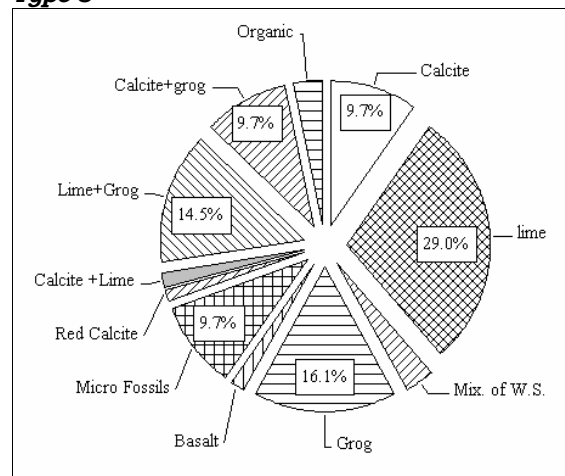
### Clay and Non-Plastics

The grey burnish has a much finer fabric than other types.

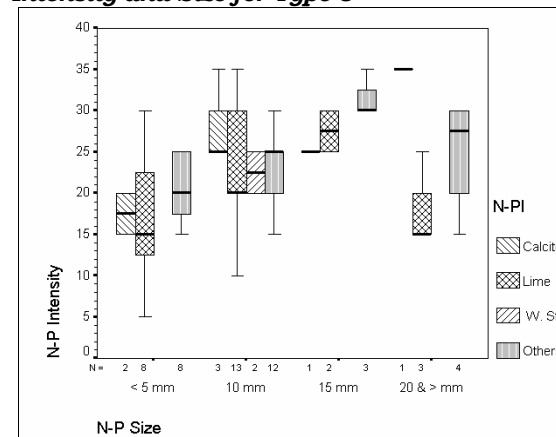
The coarse fabric specimens occurred mainly in Stratum III, while the very fine ware from

Stratum IV.

**Figure 6.8.2: Pie Chart of N-Plastic Types for Type 8**



**Figure 6.8.3: Box plot of Non-Plastics Type, Intensity and Size for Type 8**



Thin sections show that the clay matrix is built from more than one clay type. One section was composed of heavy microfossils and shells, with mica and quartz. The other shows an even distribution of these elements. Both sherds were tempered with grog, calcite, hematite, and lime.

Macroscopic analysis shows that lime is the most dominant non-plastic agent (29%). Calcite is less dominant (10%), the majority in Stratum III. Grog is one of the favourite tempering agents, especially in Stratum IV. It is found with 29%, but mainly combined with lime and calcite. Microfossil non plastics were used with a higher percentage than other fabrics (10%), all in Stratum III. In addition, a few samples showed

wadi stones (3.2%), all in Stratum III. A few sherds (3%) were tempered with organic materials only, mainly straw. However, organic materials were also found combined with other types (Figure 6.8.2).

Non-plastics size ranges between 0.5 and 2.5 millimetres, with an average of 1.0 millimetre. Sherds with a non-plastics size of two millimetres are found only with 13% of the sherds.

Figure 6.8.3 shows that the majority of the very fine non-plastics occurs with very low intensity (between 15% and 20%). Medium fine non-plastics occur with a higher intensity. The common tempering behaviour is to add lime with one millimetre size to a percentage of 20 to 30%. Calcite is added in fine sizes, but with lower intensity of less than 5% to 10%.

#### *Manufacturing Method*

No complete forms were found to enable us to make a full reconstruction of the manufacturing method. In addition, the manufacturing traces were removed during the burnishing of pot walls.

It appears that the majority of the grey burnished forms are handmade by the coiling method. The finishing is very high in contrast to the other types. Two or three coils are used in making each form. To make the S shape by hand is one of the difficult tasks. It requires a high skill. The rim turning to the inside is done with both the palm and the hand. It is a difficult task to do also on a slow wheel because this forming technique requires both hands to be free. A tool is used to make the walls thinner.

#### *Surface Treatment*

We know from Y'abad that the woman used to burnish her pot using a shell or a bamboo stick. The burnishing is usually applied directly to the surface; the slip burnish method is found with only 13% of the sherds.

The burnishing is done either by a tool, which leaves traces of burnished lines, or by a piece of cloth polishing. The latter process requires a slip coat before applying the burnish. The entire

surface is covered. Both techniques however, will make a lustrous surface, a common to the high quality grey burnish tradition.

#### *Firing Method*

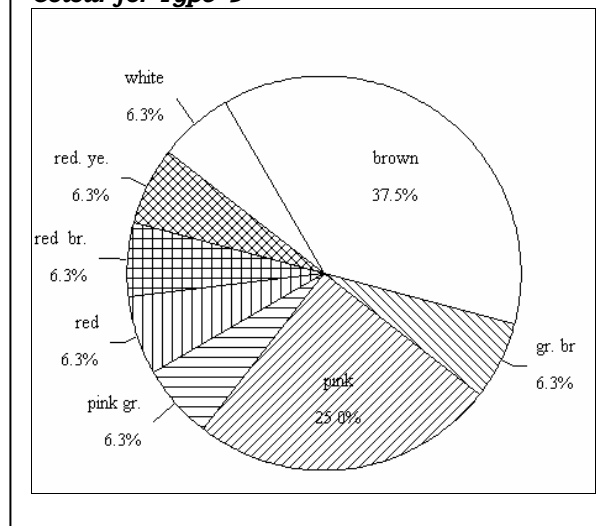
Some grey burnished sherds had reddish and yellowish cores, about 17%. These had been greyish from the outside and red from the inside, which coincides with the local clay groups. However, the majority had a full grey core.

We know that the grey (or often called by the local potters the "*Black Pottery*") is one of the pottery traditions that is distinguished by its firing method. The potter of Gaza calls it the *tatweesah* method. In a reduction atmosphere, the potter forbids oxygen inside the kiln. Therefore, the grey burnish must have been fired in a similar way. The pottery of Gaza had also some cases of a red core though the outside is carbonised. We know that kilns existed in that EBI period at sites like 'Afula and Tell al Fara'a. In case of open firing, the potter must use green fuel to create grey colour. Often potters used animal dung for this process.

#### 4.2.9 Type 9: Kraters

The krater is a class of open forms with thick walls and large body. This form was found only in Stratum IV. It had a straight body, though some kraters had a rounded and globular body. The majority come with round rims, others with

**Figure 6.9.1.1: Pie Chart of Interior Surface Colour for Type 9**

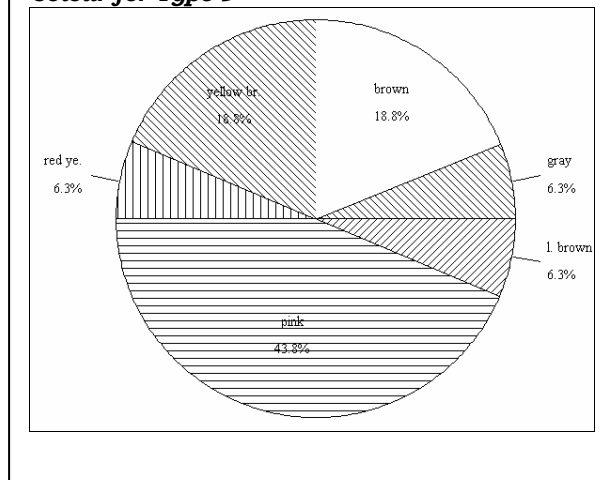


flat and flattened, and two sherds occur with ridged rims. The rims were slightly turned to the inside. Straight and out-turned rims were also found with this type.

#### Colour

Kraters showed a high variability of interior colours, perhaps due to the firing atmosphere. Exterior colour had the similar tendency toward brown and pink. *MSCC* showed the following ranges (Figure 6.9.1.1, 6.9.1.2): brown (10YR7/3, 10YR7/4, 10YR8/4), pink (5YR7/4, 7/5YR8/4), yellowish brown (10YR6/4), reddish brown (5YR6/4), red (25YR6/6/), greyish brown (10YR5/2).

**Figure 6.9.1.2: Pies Chart of Exterior Surface Colour for Type 9**



#### Measurements

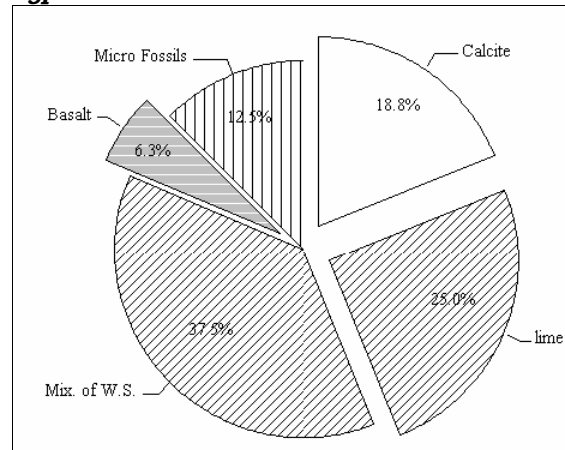
The kraters had large diameters, the largest within the entire collection. The diameter falls between 5 and 18 centimetres, with an average of 14 centimetres. The walls were thick, ranging from 10 to 28 millimetres with an average thickness of 19 millimetres.

#### Clay and Non-Plastics

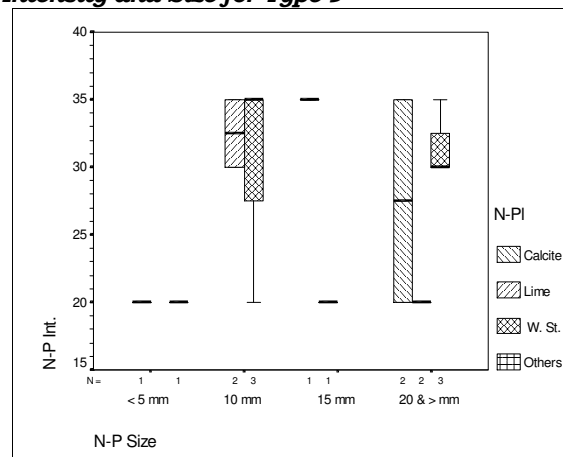
No thin section was made for this type. Macroscopic analysis shows that it had a coarser fabric than the other types. A mixture of wadi stones was the major non-plastics agent (38%). This was followed by lime. Calcite is not a popular tempering agent with this type (19%). Basalt and microfossils were used to a very

limited basis (Figure 6.9.2). Some sherds had hematite grits and sub-shells.

**Figure 6.9.2: Pie Chart of N-Plastic Types for Type 9**



**Figure 6.9.3: Box plot of Non-Plastics Type, Intensity and Size for Type 9**



Non-plastics intensity falls between 20% and 40%, with an average of 30%. The kraters contain a high percentage of large non-plastics (44%), which is one of the highest. Non-plastics size ranges from 0.5 to 2.0 millimetres, with an average of 1.4 millimetres.

Figure 6.9.3 shows that the kraters had the greatest amount of non-plastics around 30%. Mixture of wadi stones is tempered with large size and intensity. Calcite was added in fine sizes and a less amount. Other agents were added in larger sizes and amounts.



### *Manufacturing Method*

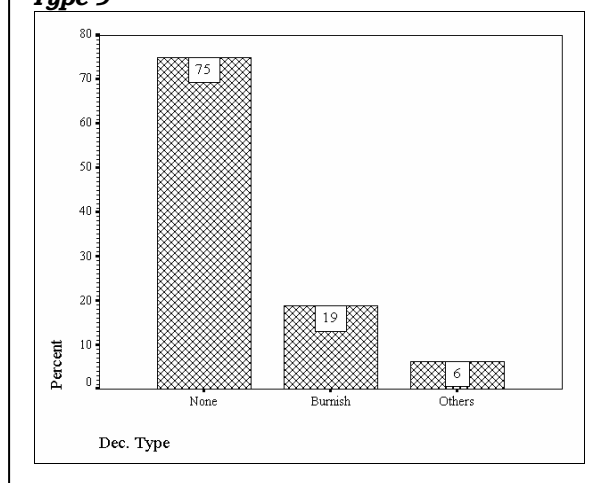
The largest number of kraters was finished on the wheel, a few of them by hand. It is difficult to reconstruct the full method in the absence of complete forms. It is more likely that the kraters are formed in a similar way to the large bowls. However, because large and thick walls require handling heavy clay mass, the potter may have used both the coiling and wheel techniques in making them. The coils are turned on the wheel.

The majority of the kraters show completely fired cores of a red colour. Grey cores are rare and mostly the grey line is in the middle. Thus, kraters were well fired. It is more likely fired in an oxidized kiln atmosphere.

### *Surface Treatment*

Most of the kraters were not decorated (47%). Some sherds were burnished (3%) or incised (7%). Others were coated with a slip from the same clay (27%).

**Figure 6.9.4: Chart of Decoration Types for Type 9**



## 5 CONCLUSION

The above presentation demonstrates that the pottery type is composed of a set of traits. The shape alone is only one trait within a type. A tradition, however, may include one or more types. However, it may be the case that a tradition is a product of a single workshop.

The type quantity approach is a tool to present

pottery type changes and similarities as developed through time. Because the shape is a technological finale, the shape-type method is very limited for predicting pottery traditions. The typological-quantitative method is best suited for drawing conclusions from sherd collections.

Furthermore, an attempt has been made to free the Tell Jenin typology from the burden of the comparative method. The major problem with the comparative method is the lack of any agreed criteria for presenting pottery data. Melikian (1986) argues that archaeologists failed to have a common description of EBI pottery, creating difficulty in identifying the common from uncommon types. By depending on the comparative method alone will overlook the pottery type local to Tell Jenin. I focus on presenting the common EBI pottery traits from the site; rather than comparing the pottery with the ill-reported types elsewhere- a common procedure followed by many archaeologists (See for example, Dessel 1991, Joffe 1993, 1999, Schaub 1996, Louhivouri 1997, Eisenberg 1989). Quantitatively, a dominant trait in one site may be less dominant in another. Reports on the recovered pottery skip pottery 'types' quantities for each phase. This makes it less possible to perceive the dominant traits over the non-dominant ones. If a certain trait is dominant in one period, it will be typical for this period at that site.

Site specific technological reporting is a long-term experience found in the publications of Franken, where a detailed focus on a single site leads to presenting the repertoire limited to it. Therefore, the approach followed above is inspired by his method (Franken 1969, 1974, Franken and Kalsbeek 1975, Franken and Steiner 1990). The logic of Franken as presented in the recent volume about Jerusalem (Franken and Steiner 1990) is worth considering. Pottery had to be quantified for each phase, time span, and then we can obtain an accurate chronology for our site.

In the summary table below (Table 5.1), certain traits were dominant during the early phases; others were not. Some types disappeared

**Table 5.1: Comparison of Pottery Traits**

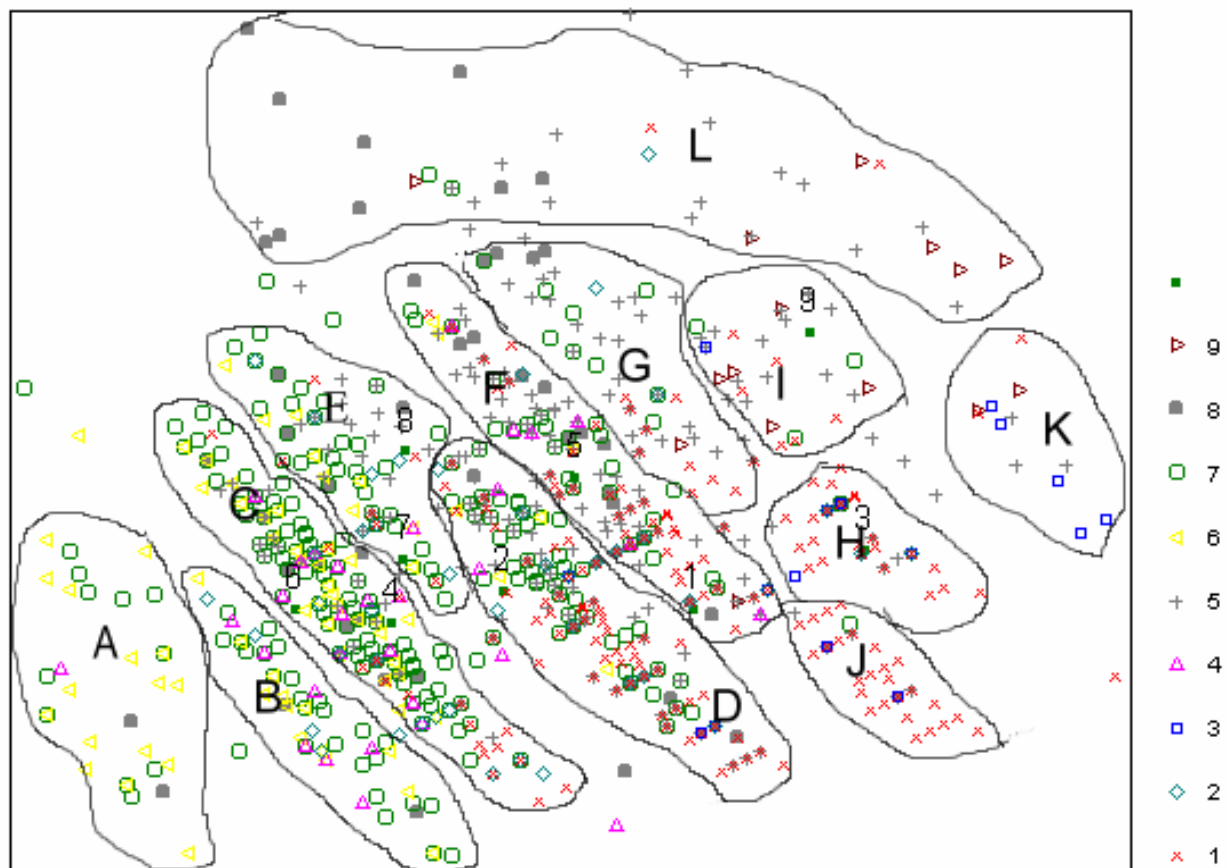
Trait	LC- EBI-A	EBI A-B
Non Plastics	Lime	Calcite
Forming method	Hand	Wheel
Shapes	Hole Mouth	Holemouth + Neck Jar
Handles	Loop	Ledge
Rims	Simple Round	Grooved, Flat
Bases	Flat	Flat
Decoration	None, slip	Red Paint Slip, Incised/Paint
Others	- Grey Burnish	+ Grey Burnish

from the repertoire; other types became popular. Table 5.1 summarizes the different traits observed in each stratum:

In addition, it was observed that some technological indices were restricted to the EBI pottery of Tell Jenin.

In the first place, mixing more than one clay type is a common behaviour today among the

different potters. The potters of Jaba' in the Jenin region mix two types of local clay. The EBI clays were also mixed in apparently the same way. Clay Sample J11 was collected from a natural riverbank located below an Early Bronze II- III site. It is pre-dated by the site remains. The Early Bronze I potters mixed this clay with another clay similar to sample J 7 or sample J 10. Both clays had similar composition to the clays of Jaba'. The Y'abad potter uses a primary clay

**Figure 7.1: Component Analysis of All the Pottery Types**

similar to J2 and J3, not mixing it with other types. They add non-plastics found locally instead.

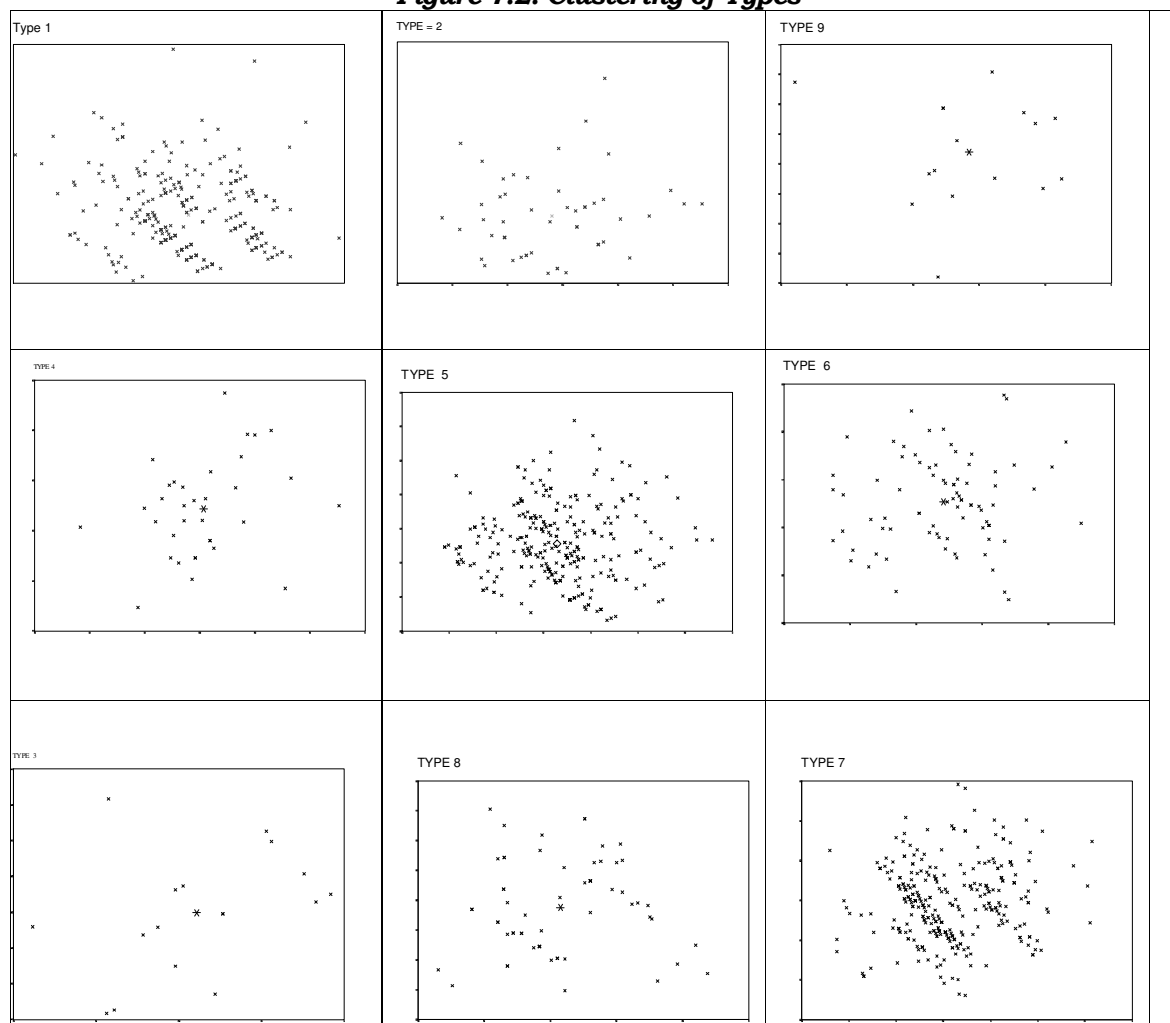
The clay use development between the two strata is obvious through the contents. The early potters of Stratum IV developed a technique of cleaning the clay from natural impurities (especially lime grits). In the later phases, calcite is added as a temper, which is a rare element in the site's region. It replaced the natural lime. Pottery tempered with the two types reflects a gradual change toward adopting the new technique.

The second technological behaviour is the introduction of the wheel. It is noticed that the wheel made pottery became dominant toward the latest phases. There is a clear relationship between the introduction of the wheel and the

development of new form attributes. For example, small objects like the hemispherical bowls are always made on the wheel. The neck jars are built by the coiling method and then finished on a slow wheel. The flaring neck is very difficult to form by hand. The upper part and the hole-mouth jar rims are made also on the wheel. However, the turning method can be also done on a tray in a technique similar to that followed by some Palestinian traditional potters.

The final technological behaviour is the preference of one pot form over another. New forms by the potter became dominant only when accepted by the potter. Most of the potters developed a new tradition by either working with other potters or by making innovations. In the beginning of the EBI period, the hole-mouth undecorated jar was the basic form. The 'hole-mouth jar' was an example of the development of

**Figure 7.2: Clustering of Types**



a tradition through time. The function of this form is problematic. On the one hand, the flat base with a ledge handle is not a typical cooking pot form. A flat base is subject to fracture when heated. The potters of Jenin may have not been aware of this fact. However, the forms that were identified as cooking pots show no major difference in shape from those which are identified as storage jars.

The surface treatment of this jar is noticeable. In the first place, female potters of el-Jib always add an incision line of dots below the rim. It is applied as a decorative feature to make it look nicer. It is also one way of marking their tradition. The incision notches found in the EBI pots may have had a similar function. However, cooking pots are usually not painted. The case from ethnography is that only the Jars are painted. No single cooking pot from the ethnographic collection of Birzeit University was painted. This is a case where a direct analogy between ethnographic contexts and archaeological context is not mechanical.

Finally, the pottery of Tell Jenin is probably made by more than one potter. Component analysis showed at least 10 different clusters.

Figure 7.1 shows component clustering of the traits of each type, while Figure 7.2 shows the clustering of all the types. The variables used in each cluster are: Decoration type, non-plastics, diameter and wall thickness. Each cluster then may represent a single workshop, since it represents work or products grouped in a standard way. Accordingly, the hole-mouth jars (Type 1) were probably made by four different potters. Some forms are distant from the main clusters and which are probably not local to Jenin. Type 2, Neck jars, had a more scattered cluster. Figures 7.1 and 7.2 indicate that Type 1 is made by two or three potters.

The clustering indicates that the pottery is made by many potters. Some potters may be related since the clusters are close. Furthermore, it is unlikely that any one of the potters makes all the forms. Potter J shows more a specialized pattern of making hole-mouth jars. Potters B, C,

F and E are very closely related. It is more likely that their traditions represent the local pottery to Tell Jenin. Potter B's production is more specialized in the open forms. This workshop produced mainly Types 6 and 7 and also some hole-mouth jars. Almost all the small bowls are made here. Workshop D produces all the types. Most of the neck jars are produced in this workshop. Potter J produces hole-mouth jars only; K produces hole-mouth and neck jars. It also produces the majority of pithoi. F is where bowls are produced. The grey burnished sherds were scattered around and most likely were made by an external workshop. However grey burnished ware may also have been made locally by workshop E. The small bowls and the neck jars are the most common. These data suggest that the pottery production is a specialized task.