

Distribution and Use of Storage Vessels in the Kingdom of Judah

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Storage vessels are among the most common artifacts found at archaeological digs. They have therefore been the subject of numerous studies, which have mainly focused on their typology, chronology, or special type, i.e., the *lmlk* jar. Less attention has been directed to their functional aspect, to how they were used in daily life. In this article, we shall discuss the distribution of large concentrations of storage vessels discovered in the Kingdom of Judah of the 8th and 7th centuries B.C.E. in order to determine patterns that will enable us to study how the various vessels were used and economic aspects related thereto.

Introduction

The storage vessels of the Iron Age II in Judah can be divided into four main groups: storage jars, holemouth jars, holemouth storage jars, and pithoi.

Storage jars are the most common, and include various types, all of which are characterized by handles that enable them to be lifted and moved, and by a narrow neck that can be sealed (Zimhoni 1990: 6, Fig. 2). Usually they range in height from 50 to 60 cm, and based on an examination of 14 typical examples from a number of sites, the effective volume of the smallest among them is around 20 liters, with the largest reaching volumes approaching 60 liters, with most holding 40–50 liters.¹ Among the typical storage jar types from Iron II Judah are the *lmlk* and the *lmlk*-like jars, the Rosetta jars, the bag-shaped jars, and jars with coastal characteristics (see, for example, Mazar and Panitz-Cohen 2001: Types SJ7, SJ8, and SJ9; Zimhoni 2004: Figs. 26.6–26.10; and Singer-Avitz 2002: Types SJ1–SJ10).

The holemouth jars are small, handleless storage vessels with a cylindrical shape and a rounded base. They are about 30 cm high and hold between five and nine liters (four typical jars were examined). These storage vessels are common in

1. The measures listed in this article relate to effective volume only, since vessels were probably not filled up to the rim, and “some empty space was left to avoid spilling (e.g., bottle necks) or for seals and corks” (Karasik and Smilansky 2006: 392). Effective volume is computed by defining the “level of filling as the starting point of the neck” (this is in contrast to the calculation of exterior volume, which is important for determining how many vessels could have been stored in a given area; see discussion in Karasik and Smilansky 2006). The calculations were performed by Michal Elkaslassy, a graduate student at Bar-Ilan University, using software developed by Karasik and Smilanski (e.g., 2006). We would like to thank her for her assistance.

assemblages found at various 8th and 7th century B.C.E. sites in Judah, for example at Timnah Strata III and II (Mazar and Panitz-Cohen 2001: 105–7, Type SJ 10), Lachish Level III (Zimhoni 2004: Fig. 26.19.4), Khirbet er-Ras (Feig 1995: 5), Moza (Greenhut 2006: 182), Arad Strata X–VII (Singer-Avitz 2002: 146, SJ 15–SJ 16), and Beersheba Stratum II (Aharoni 1973: Pl. 58:23–28).

The holemouth storage jars are characterized by a folded rim, a swollen body, and a low ringed base; some have four handles and three ridges in the shoulder area. An examination of six representative vessels showed that their volumes range from 25.5 to 51.2 liters. These vessels have been found at various sites in Judah at strata from the 8th century B.C.E., e.g., at Lachish (Zimhoni 2004: Fig. 26.5:9–12), Tel ʿEton (Zimhoni 1997a: Figs. 4.2.9, 4.7.9–11), and Tel ʿIra (Freud 1999: Fig. 6.81.8).

The pithoi are the largest of the four types of storage vessels. Their volumes range from approximately 150 to 250 liters (based on an examination of five representative pithoi, most of whose volumes lie in the lower range). Pithoi have elongated bodies, and their sides are thick compared to those of other storage jars. Pithoi have been found at various 8th and 7th century B.C.E. sites in Judah, among them, the Ophel in Jerusalem (Mazar and Mazar 1989: Pl. 20:6–7), Lachish (Zimhoni 2004: Fig. 26.50.6), and Tel ʿIra (Freud 1999: Fig. 6.76–77).

It appears reasonable to assume that the various jar types served different purposes. Holemouth jars, for example, appear most suited to storing grain, while storage jars, which could be hermetically sealed and whose contents could be poured, are more suited to storing liquids such as oil and wine.

Yet an examination of the finds shows that the matter is not that simple. For example, the assemblages exposed at Moza (Greenhut 2006: 236), Khirbet er-Ras (Feig 1996: 3), and Beth-Shemesh (Bunimovitz and Lederman, personal communication) all include dozens of holemouth jars. While the holemouth jars found at Moza were located alongside silos, and it is therefore reasonable to assume that they served as grain storage containers, at Beth-Shemesh they were apparently associated with olive oil production (see below); those uncovered at Khirbet er-Ras were likely associated with wine production (Feig 1995: 6). It therefore appears that the same jar types were used to store both liquids and solid products.

The Finds

There is no doubt that in late monarchic times the Kingdom of Judah had a royal, state-administered storage system. This can be deduced from the textual evidence, for example the Arad ostraca (e.g., Aharoni 1981: 143), and from the direct archaeological evidence, i.e., the existence of special buildings that served for large-scale storage purposes. It is not our intention here to study the enigmatic “pillared buildings,” the finds in which do not necessarily point to storage (e.g., Faust 2005: 113–15 and references), but rather to deal with buildings in which dozens of storage jars were discovered. Those constitute the basis for the present discussion.²

2. It is not our intention to deal with household storage. Private structures will be mentioned only when their findings reflect storage in excess of the household’s needs. It is therefore impor-



Timnah (Tel Batash)

A storehouse with many *lmlk* storage jars was unearthed in Stratum III from the 8th century B.C.E. The structure has two longitudinal spaces, and is situated in a residential quarter that was exposed in the northeast section of the mound. The southern space measures 11.35 × 5 m, and the northern space measures 11.20 × 4.3 m. It appears that the building extended toward a street running parallel to the city wall. The northern space is paved with flagstones which were covered with a thick layer of lime. Thirty-three *lmlk* jars were found in this space, as well as scoops that appear to have been used for transferring products into and from the jars (Mazar 1997: 189–90). The latter may suggest that at least part of the products stored in the building were not liquids. According to the excavator the structure served a military regiment that was stationed in the area (Mazar 1997: 192).

Beth-Shemesh

In Stratum III, dated to the early 8th century B.C.E., dozens of holemouth jars were found in Area E, and they were accompanied by many scoops, 11 *lmlk*-like jars, and a few pithoi. Although the architectural context is not clear, it is likely that the storage vessels were part of a storage facility. While it is not impossible to connect this storage to the silo and large (royal?) building uncovered by Grant at some distance (Grant and Wright 1939: 70; Wright 1962: 131), and hence to interpret it as related to the storage of grain (Greenhut 2006: 160), the excavators believe that it is much more likely that the storage vessels served the olive oil industry, evidence for which was found nearby (Shlomo Bunimoviz, personal communication). Additional holemouth jars unearthed within installations for the production of olive oil were found in the late 8th century level, both during early excavations (e.g., Momi-gliano 1996: Fig. 4) and by the more recent excavators (for Area E, see Bunimovitz and Lederman 2000: 255; for Area B, see Greenhut 2006: 161).

Moza

Stratum V, dated to the 8th century B.C.E., is characterized by many silos that were uncovered in the various excavation areas. In Area A, 25 silos were unearthed, with the volume of the largest ones reaching nearly two cubic meters (most were much smaller; Greenhut 2006: 200–204). Many of the silos reach bedrock and are built of small field-stones; some have stone pavement. At the bottom of some of the silos, stone pillars, probably intended to support a ceiling, were unearthed (Greenhut 2006: 204–5). Adjacent to the silos a three-room structure was uncovered. In the central room, which measured 3.8 × 4 m, 132 smashed holemouth jars were found on the floor. Based on the breakage pattern, it can be suggested that they had been placed on shelves along the walls, or one atop the other (Greenhut 2006:

tant to emphasize that despite the fact that in this article we shall try to arrive at a few generalizations, it is likely that in the household sector, the range of use of various vessels is broader, going beyond the scope of this article.



204–5). The finds that were found in the site led the excavators to suggest that the site was part of the royal system (De Groot and Greenhut 1997: 44–45).

Khirbet er-Ras

The site is located on the southern slope of the Manahat Hill, southwest of Jerusalem. A number of farmsteads were uncovered in the area, some of which are of the “four-room” type. Alongside the buildings, agricultural installations that were used for processing of agricultural products were unearthed (Gibson and Edelstein 1985: 140; Feig 2000: 398–99). In one farmstead, an assemblage of some 300 holemouth jars was found, along with 5 storage jars.³ The vessels were found in the broad back space of a four room building (Feig 1995: 5). Although the storage capacity greatly exceeds the needs of a household, it is clear that it was a storeroom that was part of a dwelling.

The Ophel, Jerusalem

Remains of a few public buildings have been uncovered in the Ophel—the saddle that links the hill of the City of David and the Temple Mount. The first explorer of this area was Charles Warren, who in 1867 excavated the ruins of two towers built of fine ashlar blocks, labeled Tower A and Tower B. The larger of the two towers (B) was 24 m long and 19 m wide. The smaller tower (A) adjoined the northern face of Tower B; Tower A was 16 m long and 8 m wide. In 1967, Kathleen Kenyon uncovered the eastern face of Tower A (Mazar and Mazar 1989: 3). In Benjamin Mazar’s 1976 excavations, a building was uncovered north of Tower A (Building C) that contains two rooms of equal size, measuring 2.80 × 2.40 m. Due to its position, dating, and nature, the excavator identified it as the biblical “House of Millo” (Mazar and Mazar 1989: 13). During 1986–1987, the excavations were renewed, by Eilat Mazar, who suggested that the structure might be a gatehouse consisting of two chambers on each side of an entryway. The southwestern room, with 40 storage jars, is the only one that survived intact (Locus 23041); no other storage vessels were found (Mazar and Mazar 1989: 16, Eilat Mazar, personal communication). Based on this ceramic assemblage, the structure was dated to the 7th–early 6th centuries B.C.E. (Mazar and Mazar 1989: 19). The location of the storeroom within a large public complex, perhaps a gate that leads to the royal compound, points to its importance. To the northeast of this room Eilat Mazar uncovered another public building (Building D) that was only partially excavated. In the eastern room, which measured 2.5 × 5.75 m, seven pithoi were discovered, crowded together along the length of the wall. In the adjoining room, an additional five pithoi were discovered, also placed along the length of the wall (Mazar and Mazar 1989: 29–48). On one of the jars the inscription לשר האו [LŠRHʾO] was engraved. The excavators assume that the inscription originally read לשר האוןפים, “to the Minister of the Ba[kery].” The last phase of the building, in which the pithoi were found, dates to the very

3. We would like to thank Nurit Feig, who supplied us with the information from the Khirbet er-Ras excavations prior to its publication.



end of the Iron Age, and was destroyed by the Babylonians in 586 B.C.E. (Mazar and Mazar: 60).

Lachish

Storeroom 4014, adjoining the inner gate at its northeastern side, contains a 1.60×4.50 m room with walls of small unworked stones and a plastered brick superstructure. The floor is made of packed earth (Zimhoni 1990: 4). The ceramic assemblage found in the structure included 43 storage jars, one holemouth jar, and 4 holemouth storage jars (Zimhoni 2004: Figs. 26.5:9–26.11:4). The structure was destroyed by fire, along with the rest of Level III, and it appears that the temperature of the fire was high enough to bake the bricks. It can be suggested that the vessels contained oil or some other flammable material, and this was the cause for the high temperatures during the conflagration (Zimhoni 1990: 7). The nature of Storeroom 4014 is not clear. While its location hints at a royal enterprise, perhaps part of the preparation for Sennacherib's campaign, some additional finds (e.g., loom-weights) hint at a more residential nature. Since, however, loom-weights were found in some instances in public contexts, it seems that the public interpretation of the room is more plausible.

In Level II (7th century–early 6th century B.C.E.), two rooms, part of a building that lay adjacent to the city gate, were uncovered. The two rooms (4084 and 4086) were designed as a single rectangular unit measuring 15×3.0 – 3.9 m; each unit was 7 m long. The floor and walls were plastered white. Forty-six storage jars, one holemouth jar, one holemouth storage jar, and one pithos were found in the storeroom (Zimhoni 2004: Fig. 26.44–26.50: 3–6). A large quantity of charred wood was found in both rooms, possibly the remains of shelves upon which vessels had rested. We can learn about the vessels' contents from ink writings found on two decanters: יין עשן (YYN.ŠN; “wine from ‘Ashan”) and מז צמקם שחרת (MZ.ŠMQM.ŠHRT; “extract of black raisins”) (Lemaire 2004: 2119, 2124).

The fact that the palace/fort that served as the administrative center of Lachish was not rebuilt in Level II, and that no other public building was uncovered at this level, led the excavators to conclude that at that time the gatehouse complex was the administrative center of Lachish (Ussishkin 2004a: 522). It is likely that Storerooms 4084 and 4086, which were situated adjacent to the gate, were part of this complex.

Tel Ira

In Stratum VII, dated to the first half of the 7th century B.C.E., a storeroom was found near the city gate. The building, which was erected on a natural terrace, was 1.5 m lower than the city gate surface, and included two rooms in an L shape. One unit measured 3.25×6.5 m, and the other measured about 3×3 m. A stone mortar 0.75 m in diameter was uncovered in the building, mostly sunk in the floor (Finkelstein and Beit-Arieh 1999: 83–87). Thirteen storage jars, one holemouth storage jar, one holemouth jar, and 31 pithoi were discovered in the storeroom (Freud 1999: Figs. 6.74.24–25–6.79). The building's proximity to the gate makes it likely that it served royal purposes.



Discussion

Several factors must be examined in order to explain the distribution of the various types of storage jars at the different sites:

1. Is there a disparity in the frequency of the various types of vessels based on the type of settlement in which they are found, and the settlements' status within the settlement hierarchy in the Kingdom of Judah? Is there a difference, for example, between Khirbet er-Ras—a farmstead—and Lachish, the second most important city in Judah?

2. Though the Kingdom of Judah occupied a small area, it encompassed several different ecosystems and geographical regions: the Jerusalem and Hebron Hills, the Negev, the Judean Desert, and the Shephelah (the lowlands). Can a geographical pattern in the distribution of the various storage-vessels be identified?

3. Can the differences be explained by a functional analysis of the Judahite city-plan, i.e., do certain types of storage vessels appear consistently in the same part of the settlement?

Table 1. Summary of Findings

Site	Storage jars	Hole-mouth jars	Hole-mouth storage jars	Pithoi	Royal/domestic	Classification	Location in relation to gate	Region
Timnah	33	—	—	—	royal	city		Northern Shephelah
Beth-Shemesh	11	dozens	—	present	royal	city		Northern Shephelah
Moza	—	132	—	—	royal	royal estate		Jerusalem and environs
Ophel structure C	40	—	—	—	royal	capital	near the gate	Jerusalem and environs
Ophel structure D	—	—	—	12	royal	capital		Jerusalem and environs
Khirbet er-Ras	5	300	—	—	domestic	farmstead		Jerusalem and environs
Lachish 4014	43	1	4	—	royal?	central city	near the gate	Southern Shephelah
Lachish 4084/86	46	1	1	1	royal	central city	near the gate	Southern Shephelah
Tel 'Ira	13	1	1	31	royal	city	near the gate	Beersheba Valley

Differences according to Settlement Type

As can be seen in the above table, no clear pattern can be identified as far as the type of settlement in which the vessels were found is concerned. Dozens of holemouth jars were uncovered in a private structure at Khirbet er-Ras, which was a farmstead in the agriculture periphery of Jerusalem; and a similar find characterizes the storeroom at Moza, which probably functioned as a royal estate (Greenhut 2006: 312; Faust 2007; Katz forthcoming). An examination of the status of the different sites within Judah's settlement hierarchy reveals that in this case too no



common characteristics can be identified: concentrations of holemouth jars have been found in Beth-Shemesh (a city), Khirbet er-Ras (a farmstead), and Moza (a royal estate).

Differences according to Geographical Location

An examination of the geography/ecology also reveals no clear pattern. In the Jerusalem area, many storage jars were found at the Ophel, and many holemouth jars were found at nearby Moza. In the northern Shephelah, storage jars form the typical find at Timnah (Tel Batash), while at Beth-Shemesh, only 7 km away, holemouth jars form the main component of the assemblage discussed. We should note, however, that in parts of southern Judah, the absence of holemouth jars is conspicuous, as it is at Lachish and Tel 'Ira.⁴

The fact that there are no clearly identifiable patterns seems to suggest that the differences are random, and that in a settlement in which a structure containing holemouth jars was found, another structure could have contained storage jars.

Differences according to Distribution within Sites

It seems, however, that a detailed examination of the areas within the settlements, or more precisely the type of building in which storage vessels were found, reveals an interesting pattern. Storage jars and pithoi dominate the royal storage structures in general, and especially those in the public quarters that were unearthed near city gates. In contrast, high concentrations of the smaller storage vessels—especially the holemouth jars—have been discovered near locations where agricultural products were processed.

Thus, pithoi were more common in royal storehouses, which were in many cases built near city gates, for example, in Building D in the Ophel and in Tel 'Ira. Storage jars were also common in royal storehouses near gates, for example, at Tel 'Ira, Building C at the Ophel, and in both storerooms at Lachish.⁵ Many small storage vessels were unearthed, on the other hand, at Beth-Shemesh near the olive presses or in relation to the olive-production process, and similar vessels were unearthed at Moza, which was a regional storage area located in close proximity to the grain fields of the Soreq Valley. The same is true for the large concentration of holemouth jars unearthed at Khirbet er-Ras.

It can be assumed that due to the difficulty of transporting high-volume pottery vessels, this was avoided whenever possible.⁶ Products that needed to be stored temporarily and then transported locally were stored in small, low-volume pottery

4. Absence of holemouth jars is typical of other sites in the Beersheba Valley, which are not discussed here, since no storerooms have been found there as yet, e.g., at Ḥorvat 'Uza and Tel Malḥatah (Liora Freud, personal communication).

5. While the storeroom at Timnah is not adjacent to the gate, in the excavators' opinion, it should still be interpreted as a public storehouse, as it served a military regiment stationed there.

6. Transportation of products over long distances, i.e., between settlements and regions, was apparently done in sacks or skins, which offered a great advantage over transportation in pottery vessels: the latter could not be loaded comfortably onto a pack animal. Moreover, the vessels' weight reduced practicality, as it reduced the quantity that a beast could bear. Finally, pottery is breakable, and therefore the risk of loss of products was higher than if less fragile containers were used. For more on transportation in sacks, see, for example, Goitein 1967: 334; Faust and Weiss



vessels, e.g., holemouth jars. The connection between storage in holemouth jars and production processes can also be seen, in addition to the above-mentioned sites, at Khirbet Abu Shawan, south of Jerusalem. The farmstead included two structures, and alongside them agriculture facilities (Baruch 2007: 25). In Building 200, a room (201) was uncovered wherein sherds of 10 holemouth jars were found. Next to it, in Room 214, an installation was discovered that was likely used for producing olive oil (Baruch 2007: 27–28). It appears, therefore, that holemouth jars and perhaps other small storage vessels were used for temporary, on-site storage, and perhaps even for local transportation of products, where the danger of loss due to jolting of the pottery vessels was small (see below).

Permanent royal storage was conducted in large vessels placed in storehouses, since in this case there were no plans for immediate transportation of the vessels' contents.⁷ The advantage of storage in large vessels is obvious, as it enabled better exploitation of the storage space. It should also be noted that there was an advantage to long-term storage in pottery vessels as opposed to sacks or skin containers, as the former prevented rodent infestation.

It appears that when the need arose, the products stored in the large vessels were removed from these containers and divided among smaller containers. The actual transportation was carried out in smaller vessels; the pithoi and the storage jars remained in the storerooms waiting to be refilled.

Summary

An analysis of the distribution of storage jar concentrations discovered at excavations of 8th–7th century B.C.E. Judahite sites reveals a pattern: larger storage vessels were used en masse in royal storehouses, usually those discovered near city gates; smaller vessels, particularly holemouth jars, were used in complexes discovered near areas of primary production. It seems that there was no direct connection between the types of products stored and the type of container used. The most significant factor in determining the type of vessels used was the storage context and the anticipated storage period. For temporary storage of a product intended for local transportation, use was made of small pottery vessels that on the one hand preserved the product, but on the other hand eased transportation. For long-term storage in storehouses, large storage jars were used that enabled better preservation of the product and better use of space.

We believe that the considerations presented above were not the only factors influencing the choice of storage vessels for various functions. We also believe that as additional information is acquired in the future, we will be able to add other considerations and understand more about how the ancients used the various vessels. In the interim, we hope that the present discussion will advance the study of the processes of production and storage in antiquity.

2005: 84–85, and additional references; for transportation in skin containers, see, for example, Goitein 1967: 333–34.

7. If the products were brought from a distance, they were transported from the sacks or skin containers to the large ceramic containers. If the products were brought from nearby, it is also possible that they were transported in holemouth jars or in similar relatively small pottery vessels.



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