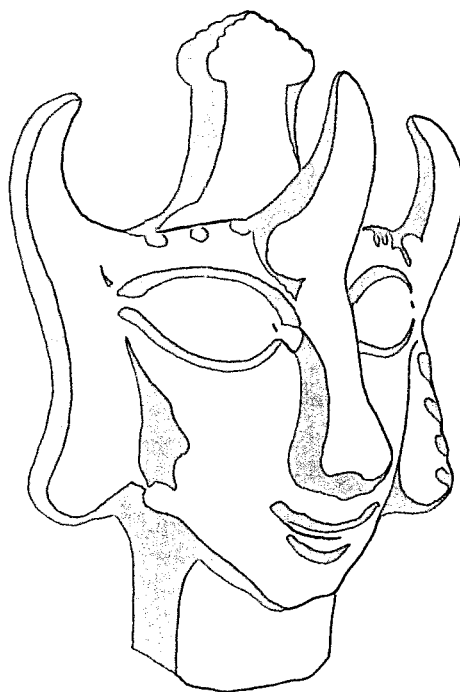


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# OIL PRODUCTION IN THE GOLAN HEIGHTS DURING THE CHALCOLITHIC PERIOD

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## Introduction

The olive has long been recognized as one of the earliest fruits to have been cultivated throughout the eastern Mediterranean basin (Zohary and Spiegel-Roy 1975)<sup>1</sup>. In the region of the Jordan Rift Valley, the remains of olive pits have been found at a number of sites dating to the Chalcolithic period: Teleilat Ghassul (*ibid.*: Fig. 1; Neef 1990:297), the Golan (Epstein 1979:226; Fig. 1 and Table I below), Abu Hamid (Dollfus a.o. 1988:34 and Arabic section: Fig.21; Dollfus and Kafafi 1990:7), Tel Tsaf (Gophna and Sadeh 1988–1989:33, note 5), Pella ((Willcox 1989) and Tell esh-Shuna North (Neef 1990:299). It can thus be inferred that already in the 4th millennium B.C.E. the olive played an important part in the economy, especially in the northern part of the country.<sup>2</sup> This was no doubt due to the recognition of its many uses, including the burning of crushed pits and dried pulp for fuel (Kaplan 1963:302; Neef 1990:298). The occasional lamp recovered at Ghassul with traces of soot (*Ghassul I*:75; Pl. 33:4; Lee 1973:280, No. LB9), and the small bowls with rims partially blackened by a burning wick found at Arad and the Beer-sheba sites (Amiran a.o. 1978:7; Pl. 1:19–20; Perrot 1984:89), point to the limited use of oil for lighting.

With the passing of the centuries, oleoculture was expanded, doubtless as the result of a greater appreciation of the value of the olive not only as an edible fruit, but even more on account of its oil-giving properties. There is evidence of developed oil-making installations from the 3rd millennium B.C.E. With time, oil production was no longer confined to the requirements of family consumption, and by the Iron Age oil had become an important trading commodity and was widely produced on an industrial scale. This can be inferred from the large-scale, technically improved olive presses excavated at several sites, of which those at Tel Miqne-Ekron are an outstanding example (Dothan and Gitin 1987). The traditional methods used in Iron Age oil production continued in use for centuries, through the Roman and Byzantine periods (Hestrin and Yeivin 1977; Gutman and Gardner 1986:38; Fig.

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- 1 Recently the suggestion was made that since it is well-nigh impossible to distinguish between the remains of cultivated and wild olives, the olive tree may not have been cultivated before the Early Bronze Age (Lipshchitz a.o. 1991).
  - 2 In addition to the above sites, remains of wild olives were identified at Benei Beraq (Kaplan 1963:302); a single olive stone was identified at Tel Masos (Lipshchitz and Waisel 1983); olives found in the Cave of the Treasure were no doubt transferred there, as was the "Treasure" itself (Bar-Adon 1971:208; Fig. 251).

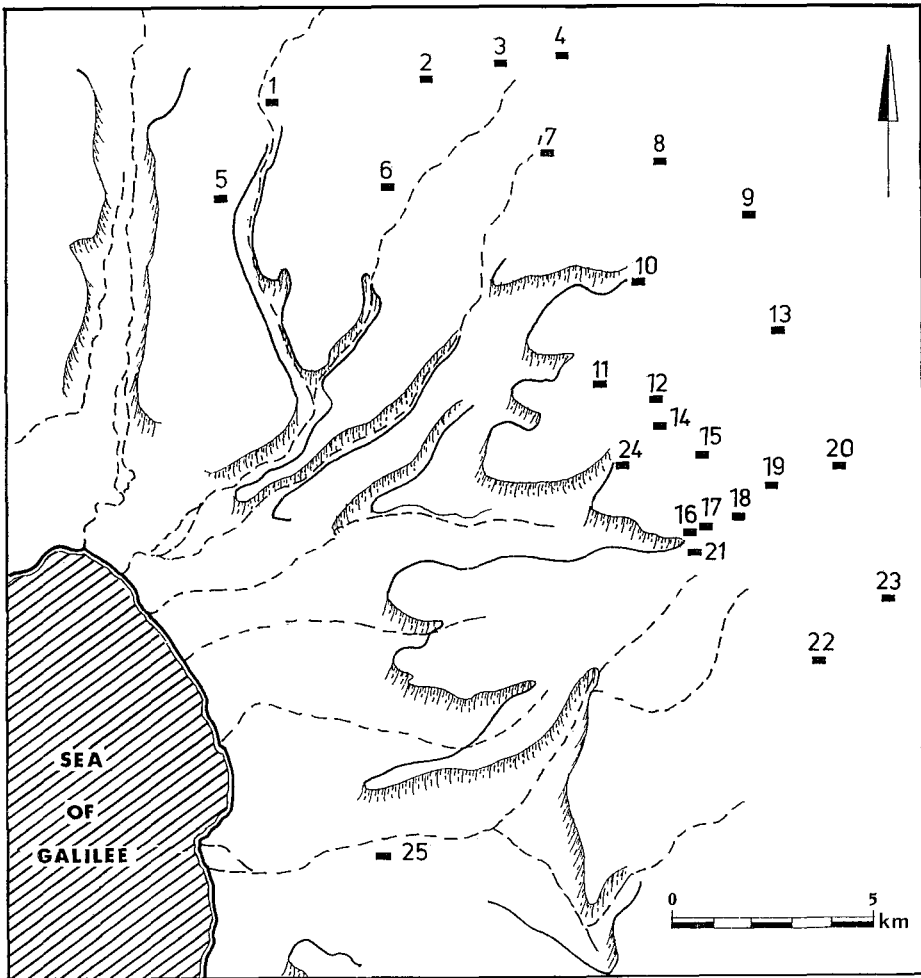


Fig. 1. Map of identified Chalcolithic sites in the Golan. The following are mentioned in the text: 11. Shabbe; 12. Rasm Harbush; 14. Site northwest of Qaliq; 18. "Silo Site"; 20. 'Ain el-Hariri; 22. Rasm el-Kabash.

18) down to modern times, when technical innovations were introduced. Even today, with the use of mechanical equipment, the basic oil-making processes are those used from time immemorial.

Throughout the ages oil has been produced by the following essential processes: the placing of quantities of fruit in a large container or crushing basin, where it is reduced to a pulp; the pressing of the pulp, using simple or more complicated equipment; the collection of the extracted juice into vats in which the oil rises to the surface enabling it to be skimmed off into containers of various sizes for storing.

Bearing in mind that traditional methods of oil production continued in use for hundreds of years, it is the purpose of this paper to re-examine the evidence that

simple oil production was already a common domestic practice in the Chalcolithic period in the Golan Heights. Not only have olive remnants been found (Fig. 2), but there is every indication that the necessary equipment has also come to light, although not hitherto recognized as such.



Fig. 2. Olives from Rasm Harbush.

### The Crushing Process

More than 15 trough-like basins have come to light in Chalcolithic houses at different sites in the Golan Heights, and there are almost certainly many additional fragments not yet identified as such. Owing to their unwieldiness, many were left in the fields as found (Fig. 3). The majority are made of fine-grained basalt, and while no single example is complete, it is evident that they were mostly elongated, boat-shaped vessels, although one or two may have been more circular in shape. Regardless of size (extant length: 30–67 cm., extant width: 26–48 cm.), they are characterized by an upcurving rim which distinguishes them from the ubiquitous oval-shaped querns with flattened upper surface used for the manifold grinding and pounding activities of the household (Fig. 4). The inference is that these large, naviform vessels (Fig. 5) were fashioned expressly to fulfill a function other than

milling, and it is suggested that they were used as crushing basins in the production of oil. Their specific shape enabled them to hold a manageable quantity of olives for crushing.

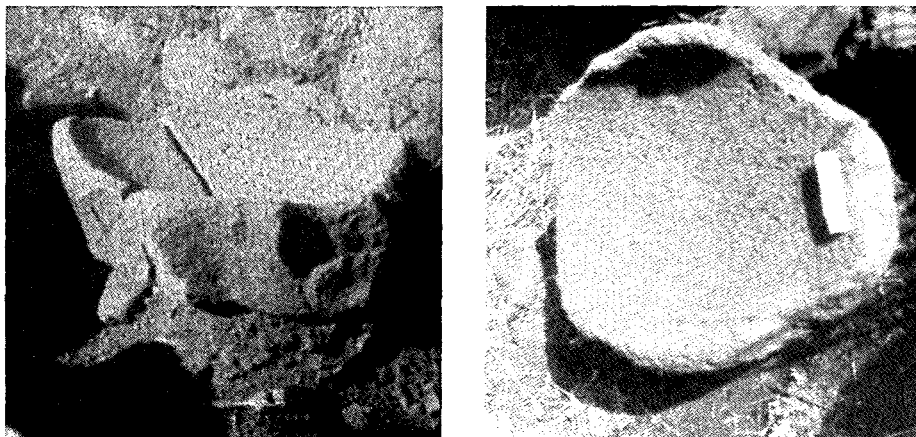


Fig. 3. Remains of trough-like basalt basins *in situ*: House 23, <sup>c</sup>Ain el-Hariri (left); and House F, Rasm Harbush (right).

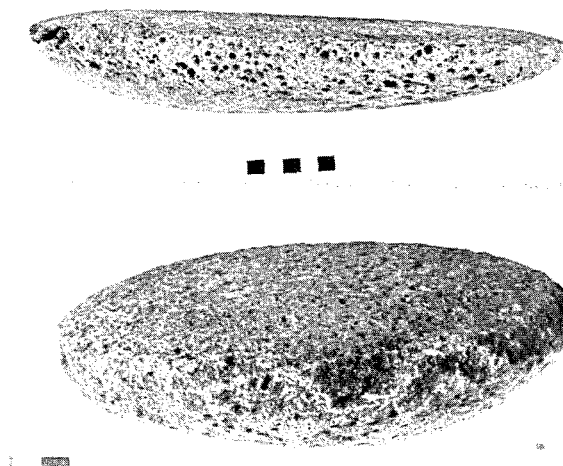


Fig. 4. Typical oval querns with flattened upper surface.

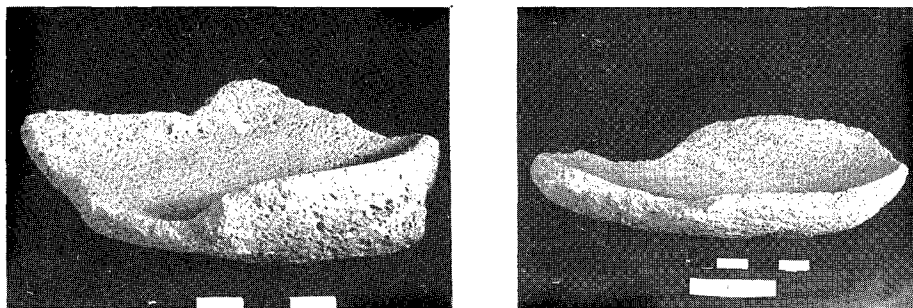


Fig. 5. Broken trough-like basalt basins with up-curving sides: House 5, site northwest of Qaliq (left); and House 19, Rasm Harbush (right).

The above interpretation is supported by the fact that crushing installations from the 3rd millennium onwards continued to incorporate a markedly upturned rim (even when rock-cut), thereby preserving one of the intrinsic features of the earlier utensil. This is well illustrated by the shallow crushing basin surrounded by a low skirting-wall hewn in the soft rock from an EB II–III context at Ta'anach (Lapp 1969:12; Fig. 8). Even more striking is the discovery in an EB III context at the Leviah Enclosure in southern Golan of a broken basalt crushing basin identical to the earlier Chalcolithic type, demonstrating yet again the persistent use of traditional methods in oil production through the centuries. Here, the association of the basalt crushing basin with oil extraction is not in doubt, since it was found in a courtyard olive press, in the centre of which was a sunken, grooved collecting basin (Kochavi 1993:916). Thus, while the crushing of the fruit was still carried out with the aid of age-old equipment, the pulp was now pressed on a prepared, flattened surface from which the expressed juice ran into a sunken vat. From the end of the 3rd millennium B.C.E. at Ugarit, an even more sophisticated press was discovered. Here the *huilerie* consisted of two large, plastered, rectangular basins with low upcurving sides which were probably used both for the crushing and pressing processes, the extracted juice being collected in two adjoining sunken receiving vats (*Ugaritica IV*: Figs. 8–9). In Iron Age presses the crushing basin was of stone, especially when production was on a larger scale (Kelm and Mazar 1987a: Pl. 3:B); while at Shiqmona, in what was probably a domestic press, a stone was rotated in a small oval crushing basin whose shape recalls the naviform basalt basins of Chalcolithic times (Elgavish 1978:1103).

Assuming the validity of the above interpretation of the trough-like basalt basin as a receptacle in which olives were crushed, it remains to clarify the nature of the crushing implements employed. In the Golan there is no dearth of basalt detritus which could have been used for the crushing of olives, especially since the Chalcolithic sites are concentrated in the central Golan Heights, where Dalwe Basalt predominates (Netser 1982:27; Mor 1986:63–64). This is an overlying layer of

basalt characterized by quantities of roundish stones formed as the rock gradually disintegrated and crumbled. It is thus not surprising that in every excavated structure there were large numbers of small-sized, naturally-formed spherical and quasi-spherical stones (Fig. 6). When grasped in the hand, these stones could have served as effective instruments for crushing olives accumulated in the naviform basalt basins. It should also be noted that among the many different types of basalt artifacts there is a wide range of worked and partially-worked hand tools used for a variety of grinding, pounding and crushing purposes (Fig. 7:a). They, too, could well have been used for crushing the fruit in the initial steps of the oil-making process.

In addition to the numerous basalt implements, large numbers of various-sized flint choppers and chopping tools have been identified (Fig. 7:b) throughout the excavated sites. Although a detailed study (including trace wear analysis) has yet to be completed, the possibility cannot be ruled out that these flint implements were all-purpose tools and that many of the larger examples may also have been used for crushing olives in the trough-like basalt basins.

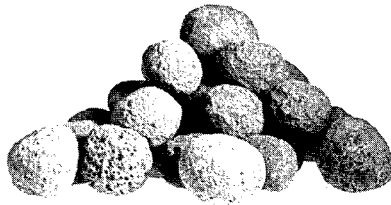


Fig. 6. Small unworked basalt stones.

### **The Pressing Process**

Nothing has been found to date that could be regarded as a specially prepared pressing surface, nor has any specific type of pressing apparatus come to light for squeezing the juice from the pulp. From as early as the Iron Age the elaborate method of piled-up baskets of pulp pressed beneath weighted beams (Kelm and Mazar 1987b:122; Fig. 1:a-a), was used in large-scale oil production. However, in Chalcolithic times oil was produced primarily for household use (see below for the suggestion that at Shabbe oil may have been manufactured on a larger scale). To this end the oil could have been extracted by beating the pulp, perhaps held in wicker baskets which would not have survived. Alternatively, the crushed fruit may have been placed on a stone surface to be pressed beneath a heavy rock fragment. In the basaltstrewn terrain of the Golan Heights there is no lack of either large, flattish

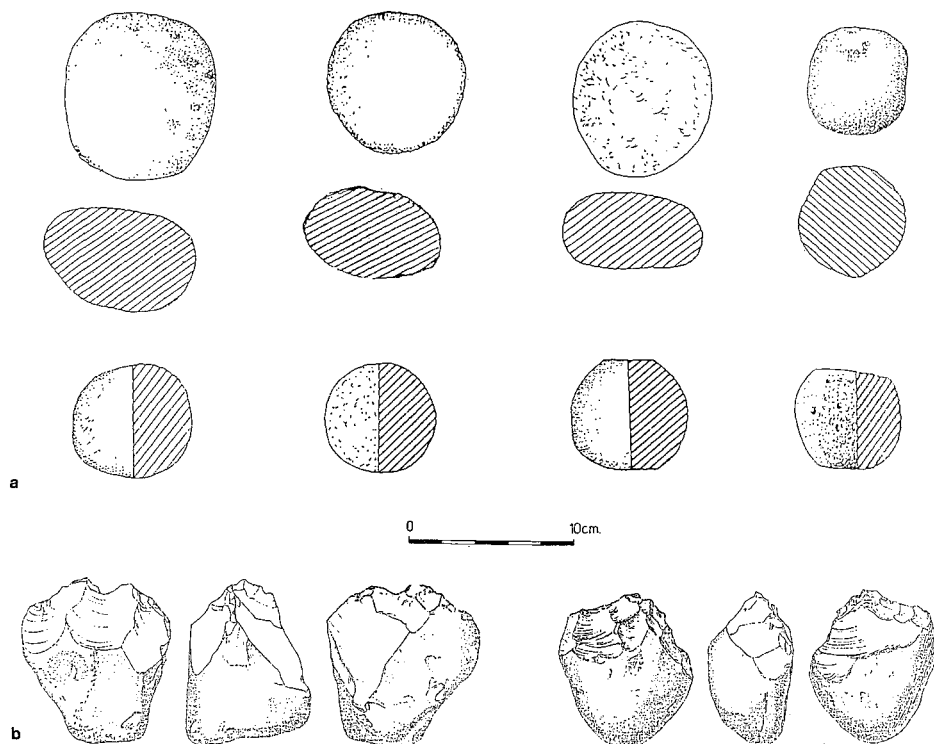


Fig. 7. a) Small basalt pounders/grinders; b) flint chopping tools.

rock surfaces nor of heavy basalt splinters, the latter providing an alternative to stone rollers used throughout the centuries to modern times (*Gezer II*:51; Dalman 1935:235–238; Abb. 47). From suitably inclined basalt rock surfaces (which are frequently pitted with rainworn hollows resembling cup-marks), it would not have been difficult to collect the juice extracted from the pressed olive pulp, then perhaps strained through a goat-hair sack — similar to the method used in domestic oil-making until quite recently (Avitsur 1984:9–10).

### The Container Vats

The Chalcolithic ceramic repertoire from the Golan Heights comprises a wide range of vessels, among them spouted kraters of which only a few could be restored (Fig. 8). A shortened version of the wide-mouthed pithos, these are medium-sized pots often decorated on the upper shoulder. The addition of a spout clearly indicates that they were intended to hold a liquid. That this was a vessel in daily use is abundantly clear from the recovery of over 50 spouts (complete and fragmentary) from houses at all the sites investigated (Fig. 9). Some spouts were equipped with a



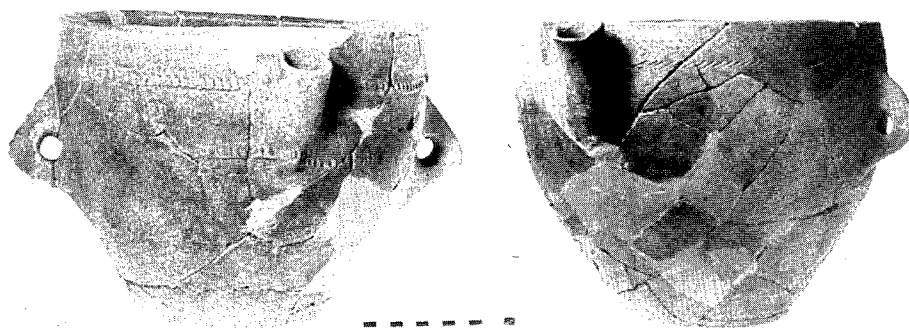


Fig. 8. Spouted kraters from House P (left) and from House Q (right), Rasm Harbush.

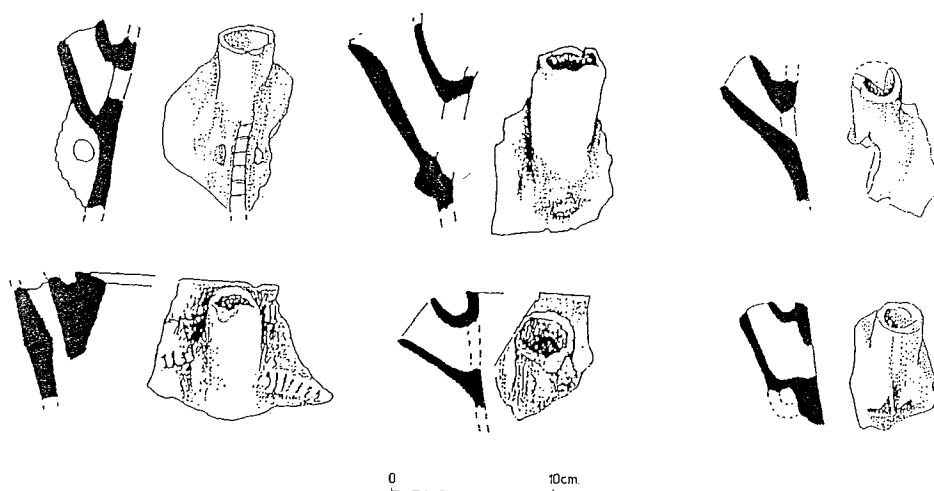


Fig. 9. Spouts from various sites.

small auxiliary handle below to facilitate controlled pouring, others bear a small knob or finger-rest; on one or two there is an inner ledge at the base of the spout-hole to prevent the outflow of accumulated sediment. These additions were designed to increase the vessel's efficiency, on the one hand by ensuring that not a drop of the liquid was lost, and on the other hand by straining the contents. Thus, it appears that the spouted kraters were made to hold a "choice" liquid, more valuable than milk or water. Certainly, milk could easily have been held in a skin container — a probability made all the more likely by the complete absence from the Golan ceramic assemblages of the typical Chalcolithic churn. This writer has long been of the opinion that, despite the lack of residual material from the vessels themselves, the highly-valued contents of the spouted kraters was oil (Epstein 1981:18, 79\*). A

similar conclusion was reached by Stager, who considered the Golan spouted krater to be the earliest example in the Levant of an oil-separator vat (Stager 1985:177; 1990:97; 1992).

There are, then, good grounds for the assumption that it was in vessels of this kind that the watery mixture obtained from the pressed fruit was collected and allowed to stand until the oil, rising to the surface, could be skimmed off — perhaps into a second spouted krater in which it may well have been stored. Thus, the spouted krater can be regarded as part of the essential equipment used in the production of oil in the Chalcolithic period in the Golan Heights — a vat for the extracted juice. It is significant that in seven of the houses in which olive pits or carbonized olive wood were recovered (Liphschitz and Waisel 1975; 1979), there were also spouts and/or a complete spouted krater (Table I below).

TABLE 1

<i>Site and house no.</i>	<i>Olive pits or wood</i>	<i>Crushing basin</i>	<i>Basalt crusher</i>	<i>Flint chopper</i>	<i>Spouted krater or spout</i>
<b>Rasm Harbush:</b>					
House 7	—	+	+	+	+
House 10	+	+	+	+	+
House 12	+	+	+	+	+
House 13	+	—	+	+	+
House 15	+	++	+	+	—
House 19	—	+	—	+	+
House A	+	—	+	+	—
House F	—	+	—	—	+
House P	+	—	+	+	+
House Q	+	—	+	+	+
House R	+	—	+	+	+
<b>‘Ain el-Hariri:</b>					
House 3	+	—	+	+	+
House 23	—	++	—	—	+
House 26	—	+	—	+	—
House 27	—	+	—	+	+
<b>“Silo Site”:</b>					
House 1	+	—	—	—	—
House 5	—	+	—	+	—
<b>Site NW of Qalq:</b>					
House 1	+	+	—	+	—
House 3	—	+	—	+	—
House 5	—	+	—	+	—
<b>Rasm el-Kabash:</b>					
House 6	—	+	—	+	+

In later, Early Bronze Age contexts, ceramic storage jars were used as collecting vats, sometimes sunk in the ground. This is exemplified by an EB III olive press from Tel Erani: the installation consisted of a pebbled courtyard in which a large pithos containing olive pits was found almost completely sunken into the ground (Yeivin 1961:8; Pl. VI; 1975:95). Likewise, in the EB III stratum at Tel Halif, where the botanical remains included olive pits, a similar type of pithos came to light, but with the addition of a spout (Seger a.o. 1990:17, 24; Fig. 14b; Table 2), recalling the earlier use of the spouted krater in the Golan.

As many traditional methods of oil production continued virtually unchanged over considerable periods of time, it is likely that the later use of ceramic container-vats for oil reflected a similar, earlier use of the spouted krater in the Chalcolithic period in the Golan Heights.

### Conclusions

In this paper a case has been presented for oil production in the Golan Heights in the Chalcolithic period. Despite the growing evidence of olives and olive wood in Chalcolithic contexts, it has not hitherto been suggested that oil was extracted by any but the simplest means, whereby the pulp was crushed in cup-mark mortars and transferred from one to another (Eitam 1987:20, 32, note 12). This method may have been used at Shabbe (Epstein and Gutman 1972:276, Site 105) where the large rock surface pitted with cup-marks (Fig. 10) suggests extraction of oil for more than family consumption. Not far to the southwest, remains of a Chalcolithic structure were identified, together with diagnostic pottery including a fragmentary spout. In



Fig. 10. Rock surface pitted with cup-marks, Shabbe.

the Byzantine period oil was manufactured nearby on a large scale, as can be inferred from a crushing basin (diameter 2 m.), and the remains of a second, cut in the basalt rock a short distance west of the earlier cup-marked rock surface (personal observation and Ben-David 1989:34).

A re-appraisal of the function of specific vessels in the Chalcolithic repertoire of the Golan Heights has shown them to be particularly well adapted for use in oil production. Thus, it is worthwhile to review the evidence for the occurrence in one and the same house of the following components necessary for oil manufacture: the remains of olives, either charred pits or burnt wood; a trough-like basalt basin; crushing implements made of basalt or flint; a spouted krater-vat or fragments of a spout. In addition, natural rocks and rock surfaces could have been utilized for pressing and squeezing the juice from the fruit pulp.

Table 1 presents the incidence of components required for oil-making in twenty-one structures which included either remains of charred olives<sup>3</sup> and/or burnt olive wood, or the remains of a trough-like basalt crushing basin. Due to this last criterium, not all sites are represented.

This analysis reveals that in two of the houses investigated all five components were present; in seven houses four components were found; in five houses three components; in six houses two components; while in a partially-excavated house in which there was no evidence of oil production, fragments of a single olive were identified among charred wheat grains in an abandoned burnt-out silo.

Despite the inclusion in the table of only a relatively small percentage of the total number of houses probed and excavated, equipment used in the extraction of oil for domestic use was present in most households. Furthermore, at the site of Rasm Harbush, out of a total of 31 samples of charred wood from six different houses (including a possible roof beam), 28 were analysed as olive wood (Liphschitz and Waisel 1975; 1979) constituting 90.3 % of the material examined.<sup>4</sup> The inference is clear: not only were olive trees cultivated, but oil extracted from the fruit was a product in general use in the Chalcolithic period in the Golan Heights.

The above collation of relevant material from house contexts in the Golan will, it is hoped, enable similar functional uses to be attributed to utensils from Chalcolithic sites elsewhere which could likewise have been used in the manufacture of oil.

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3 Olive stones from Houses 15 and R at Rasm Harbush were identified by Liphschitz and Waisel (1979); from Houses 13, A, P and Q by the writer. Single and fragmentary olive stones were identified from the "Silo Site" by M. Hopf; from 'Ain el-Hariri and the site northwest of Qaliq by the writer.

4 In addition, two samples of charred wood from el-Majami were analyzed as Calliprinos oak (Liphschitz and Waisel 1977). Even if the latter are also taken into account, olive wood remains the most commonly-found wood, constituting 84.84% of the material examined.

# REFERENCES

- Amiran, R. a.o. 1978. *Early Arad, the Chalcolithic Settlement and Early Bronze City, I. First-Fifth Seasons of Excavations, 1962–1966*. Jerusalem.
- Avitsur, S. 1984. *The Traditional Olive Press*. (Haaretz Museum Publications No. 6). Tel-Aviv. (Hebrew).
- Bar-Adon, P. 1971. *The Cave of the Treasure*. Jerusalem. (Hebrew).
- Ben-David, H. 1989. *The Olive and Oil-making in the Golan Heights During the Period of the Talmud and the Mishna*. (M.A. thesis). Bar-Ilan University. (Hebrew).
- Dalman, G. 1935. *Arbeit und Sitte in Palästina IV*. Gütersloh. (repr. 1964. Hildesheim).
- Dollfus, G. a.o. 1988. *Abu Hamid: Village du 4e millénaire de la Vallée du Jourdain*. Amman.
- Dollfus, G. and Kafafi, Z. 1990. Abu Hamid 1989: Third Season of Excavations. *Institute of Archaeology and Anthropology, Yarmouk University Newsletter* 9:5–8.
- Dothan, T. and Gitin, S. 1987. The Rise and Fall of Ekron of the Philistines. *BA* 50:195–222.
- Eitam, D. 1987. Olive Oil Production During the Biblical Period. In: Heltzer, E. and Eitam, D. eds. *Olive Oil in Antiquity*. Haifa:16–36.
- Elgavish, J. 1978. Tel Shiqmona. *Enc. Arch. Exc. IV*:1101–1109.
- Epstein, C. 1979. Notes and News: Golan Chalcolithic Sites. *IEJ* 29:225–227.
- Epstein, C. 1981. More on the Chalcolithic Culture of the Golan. *EI* 15:15–20. (Hebrew); (English summary:79\*).
- Epstein, C. and Gutman, S. 1972. The Golan Heights. In: Kochavi, M. ed. *Judaea, Samaria and the Golan: Archaeological Survey 1967–1968*. Jerusalem:244–294. (Hebrew).
- Gezer II. Macalister, R.A.S. 1912. *The Excavation of Gezer II*. London.
- Ghassul I. Mallon, A., Koeppel, R. and Neuville, R. 1934. *Teleilat Ghassul I*. Rome.
- Gophna, R. and Sadeh, S. 1988–1989. Excavations at Tel Tsaf: An Early Chalcolithic Site in the Jordan Valley. *Tel Aviv* 15–16:3–36.
- Gutman, S. and Gardner, D. 1986. Gamla. *Excavations and Surveys in Israel* 5:38–41.
- Hestrin, R. and Yeivin, Z. 1977. Oil from the Press at Tirath Yehudah. *BA* 40:29–31.
- Kaplan, J. 1963. Excavations at Benei Beraq, 1951. *IEJ* 13:300–312.
- Kelm, G.L. and Mazar, A. 1987a. Notes and News: Tell Batash (Timnah). *IEJ* 37:59–60.

- Kochavi, M. 1993. Leviah Enclosure. In: Stern, E., Lewison-Gilboa, A. and Aviram, J. eds. *The New Encyclopedia of Archaeological Excavations in the Holy Land*. Jerusalem:915-916.
- Kochavi, M. 1993. Leviah Enclosure. In: Stern, E., Lewison-Gilboa, A. and Aviram, J. eds. *The New Encyclopedia of Archaeological Excavations in the Holy Land*. Jerusalem:915-916.
- Lapp, P.W. 1969. The Excavations at Tell Ta'anek. *BASOR* 195:2-49.
- Lee, J.R. 1973. *Ghassul: New Aspects and Master Typology*. (Ph.D. thesis). Hebrew University. Jerusalem.
- Lipshchitz, N. and Waisel, Y. 1975. *Dendroarchaeological Investigations: Golan Heights*. (Mimeographed Report No. 28). Tel Aviv University. (Hebrew).
- Lipshchitz, N. and Waisel, Y. 1977. *Dendroarchaeological Investigations: Golan Heights*. (Mimeographed Report No. 52). Tel Aviv University. (Hebrew).
- Lipshchitz, N. and Waisel, Y. 1979. *Dendroarchaeological Investigations: Golan Heights*. (Mimeographed Report No. 73). Tel Aviv University. (Hebrew).
- Lipshchitz, N. and Waisel, Y. 1983. Analysis of the Botanical Material of the 1972, 1974 and 1975 Seasons of Tel Masos. In: Fritz, V. and Kempinski, A. *Ergebnisse der Ausgrabungen auf der Hirbet el-Mšāš (Tel Masos) 1972-1975*. Wiesbaden:208-213.
- Lipshchitz, N., Gophna, R., Hartman, M. and Biger, G. 1991. The Beginning of Olive (*Olea europaea*) Cultivation in the Old World: A Reassessment. *Journal of Archaeological Science* 18:441-453.
- Mor, D. 1986. *The Volcanism of the Golan Heights*. Jerusalem. (Hebrew).
- Neef, R. 1990. Introduction, Development and Environmental Implications of Olive Culture: the Evidence from Jordan. In: Bottema, S., Entjes-Nieborg, G. and Van Zeist, W. eds. *Man's Role in the Shaping of the Eastern Mediterranean Landscape*. Rotterdam:295-306.
- Netser, M. 1982. Basalts and Soils in Central and Southern Golan. (M.A. thesis). Bar-Ilan University. Ramat Gan. (Hebrew).
- Perrot, J. 1984. Structures d'habitat, mode de vie et environnement. Les villages souterrains des pasteurs de Beershéva, dans le sud d'Israël, au IV<sup>e</sup> millénaire avant l'ère chrétienne. *Paléorient* 10:75-92.
- Seger, J.D. a.o. 1990. The Bronze Age Settlements at Tell Halif: Phase II Excavations, 1983-1987. *BASOR* Supp. 26:1-32.
- Stager, L.E. 1985. The First Fruits of Civilization. In: Tubb, J.N. ed. *Palestine in the Bronze and Iron Ages, Papers in Honour of Olga Tufnell*. London:172-187.
- Stager, L.E. 1990. Shemer's Estate. *BASOR* 277-278:93-101.
- Stager, L.E. 1992. The Periodization of Palestine from Neolithic through Early

- Bronze Times. In: Ehrich R.W. ed. *Chronologies in Old World Archaeology*. (3rd. ed.). Chicago: 22–41.
- Ugaritica IV*. Schaeffer, C.F.A. 1962. *Ugaritica IV*. Paris.
- Willcox, G. 1989. *Timber and Trees — Ancient Exploitation in the Middle East: Evidence from Plant Remains*. (Mimeographed Paper. Sumerian Agricultural Group). Heidelberg.
- Yeivin, S. 1961. *The First Preliminary Report on the Excavations at Tell "Gat", Seasons 1956–1958*. Jerusalem.
- Yeivin, S. 1975. Tell el-<sup>ḥ</sup>Areini. *Enc. Arch. Exc. I*. Jerusalem:89–97.
- Zohary, D. and Spiegel-Roy, P. 1975. Beginnings of Fruit-growing in the Old World. *Science* 187:319–327.