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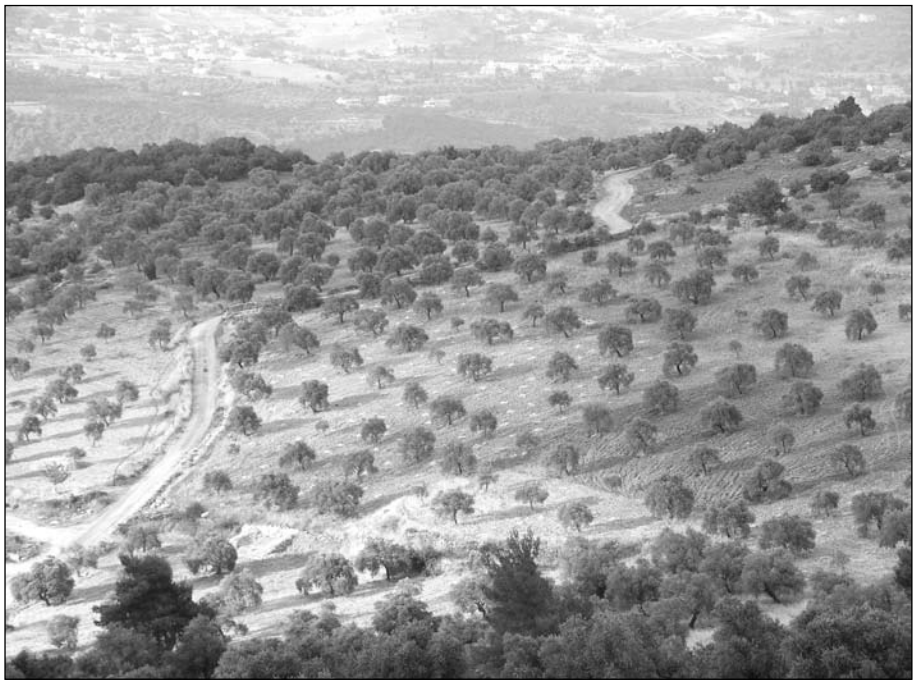
Technological Similarities Across the Jordan Valley

Introduction.
The olive tree is a typical Mediterranean plant. Its cultivation in the Near East dates back at least to the Chalcolithic and is well attested in the Bronze and Iron Age. In Jordan, traces of a possible Early Bronze Age oil press were found at Tall Rakān II / Wādī Ziqlāb (Banning and Najjar 2000) (FIG. 1).

With the transition from nomadism to sedentism, the olive tree was one of the first to be adopted by man and cultivation of better varieties began. The reason for the success of the olive tree in the region under consideration is that this area is its natural habitat, and both soil and climatic conditions are suitable for its needs. The light to medium lime and terra rossa soils, which are well aerated, encountered in the mountains of Jordan are ideal for growing olive trees. Also, the climatic conditions (long hot summers and mild winters) are optimal for the tree and the fruits. The olive tree will not fruit below the isohyet of 200mm of rain per year except, of course, in irrigated orchards. There are two main olive producing regions in modern Jordan: the western mountainous region and the north eastern desert region. The former is rain-fed; farms tends to be small, but it produces 70% of the country's total olive production. The latter is irrigated; farms tend to be larger and it produces the remaining 30% of the country's total olive production.

Domesticated olive trees have been grown in Jordan since the Chalcolithic period and since then numerous varieties of the tree have been developed. Today the most popular olive variety in the country is known as "Nabāli" or "Rūmī", possibly testifying to its ancient origin.



1. Olive trees near 'Ajlūn Castle (T. Waliszewski).

The olive harvesting season starts in October and ends in January of each year. In order to extract the precious oil from the olive fruit, the extraction process naturally focuses on the separation of the oil and supplementary liquids from the solid material. The process begins with the washing of the harvested olives with potable water and removing the leaves. Then, crushing the olives with stone mills produces a paste. The extraction of the olive oil is accomplished by pressing: the oldest and most common method of oil extraction in which pressure is applied to stacked mats, smeared with paste. The 'waste' consists of solid and liquid waste. The solid waste is used as fuel, fertilizer, herbicide and animal feed.

Such favorable environmental conditions in Jordan for olive tree cultivation should result in rich archaeological evidence for olive oil production. However, the image received from Jordan is different to that which might be expected. Almost nothing has been published on the subject, including few field reports (e.g. 'Ammān Citadel, Yājūz, as-Salṭ, Jil'ād etc.). References to olive oil installations are scarce and very incomplete. Three oil presses from the Roman period have been excavated by the French-Jordanian team at Kh. adh-Dharīḥ and remain unpublished.

Jordan appears in Raphael Frankel's impressive catalogue of oil and wine presses in the Mediterranean as an almost completely blank map with two or three points seemingly randomly selected by the author (Frankel 1999: map 7, 14, 16, 42). It is hard to believe that this image is true, especially when we take the present status of the olive oil industry in Jordan into account.

The main factor encouraging me to look into the problem of olive oil production in ancient Jordan was, on the one hand, an important gap in the scholarly literature pertaining to Jordan and dealing with this particular branch of the ancient economy and, on the other hand, the major progress made in this field in Palestine, Syria and other regions of the Mediterranean over the past 20 years, thereby enabling firm comparisons to be made (Callot 1984; Hadjisavvas 1992; Amouretti and Brun 1993). Apart the reports mentioned above, the only comprehensive and serious article on the subject in Jordan was published as recently as 2004. A.S. Abu Dayyeh has given a detailed account of an oil press building recently discovered by Y. Ulayan at 'Abdūn, 'Ammān (Abu Dayyeh 2004). We should also mention a recently published Ph.D. thesis on the "Identification of Ancient Olive Oil Processing Methods Based on Olive Remains" by Peter Warnock (Warnock 2007). It focuses on the chemical aspect of the production, rarely recorded during previous excavations, and possible ways to reconstruct ancient methods of extraction of olive oil in Jordan.

Owing to limitations of space I have decided to only to review briefly some important facts and to discuss the problem from the most important (in this instance) aspect: technical varieties of installations. Geographical and chronological issues, as they need more research, will be developed in another paper.

Olive Oil Installations in Jordan

Typically, olive installations consist of a huge stone crusher, crushing stone, beam weights, basin and, of course, a wooden beam, always missing on archaeological sites. Monumental stone elements are easily spotted on the ground surface and were thus sometimes mentioned by travelers (Glueck 1935: 9, fig. 2). Monolithic stone elements may, even to this day, form part of the landscape of a traditional Jordanian village (Biewers 1997: 153-157). As they were used in the same form and location for centuries, their dating is far from precise and remains potentially misleading.

A survey of the scholarly literature has permitted the creation of a preliminary list of all ancient oil presses or their isolated elements ever mentioned in archaeological publications pertaining to Jordan, especially fruitful was the analysis of the JADIS list of sites, which lists more than 30 oil presses from different periods. Another important source of information, the Annual of the Department of Antiquities, delivered 21 examples of oil installations mentioned or briefly described. A further 13 were found in other publications, giving a total of 64 sites where traces of olive oil production in antiquity have been recorded.

To correlate the texts with remains in the field, during course of the summer of 2005 a limited but representative number of previously identified sites was visited, starting from Abila in the north and extending to southern sites in the Petra region. Some of the sites mentioned in JADIS have already been destroyed, as at Kh. 'Ajam in Wādī al-Mūjib where the olive crusher recorded in late 1990 has disappeared under the rising waters of the new lake (Abu

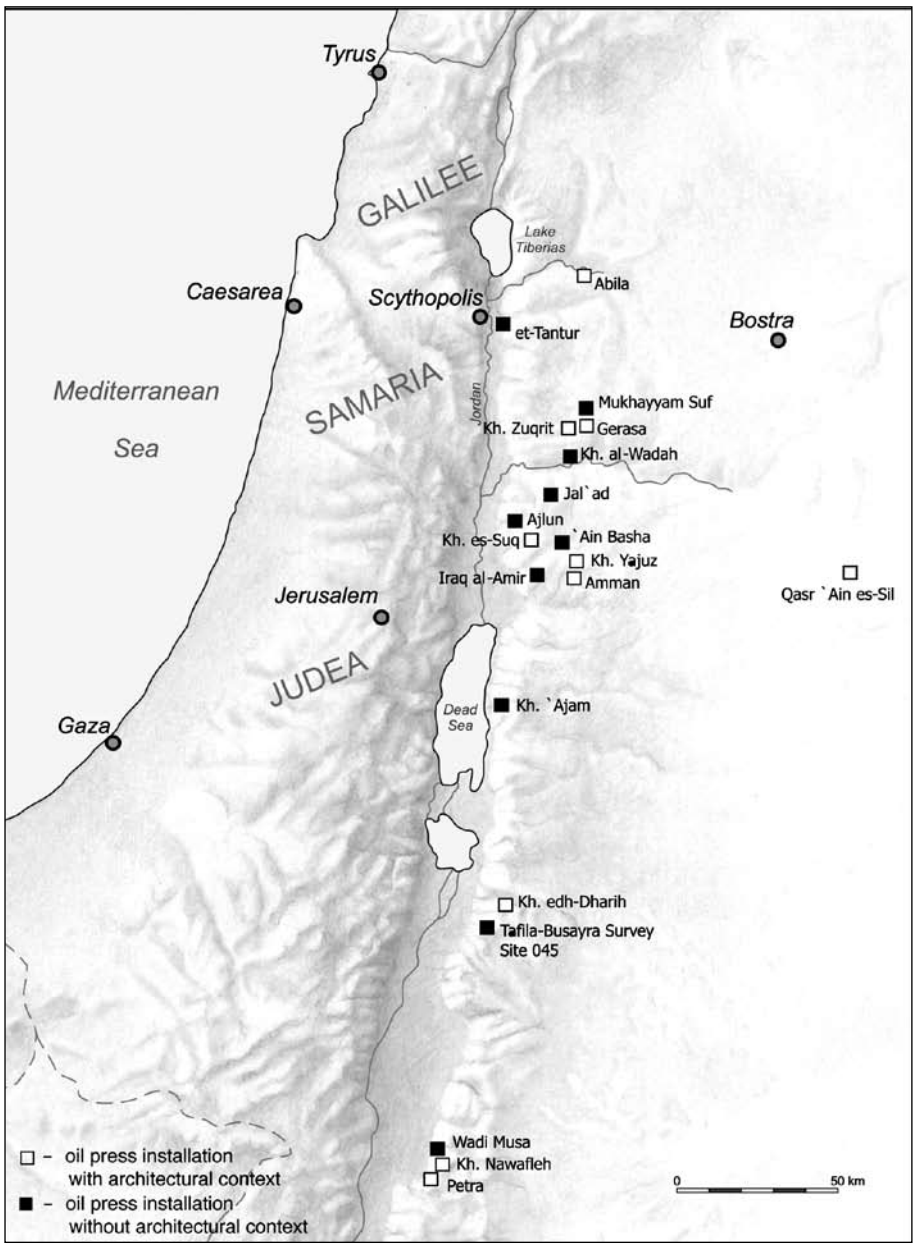
Shmais 2000: 10). Other olive installations, however, still exist.

The results of this preliminary investigation has enabled a typology of installations to be established, and some basic data about their geographical distribution and chronology to be presented.

Geographical Distribution (FIG. 2)

The geographical distribution of olive oil installations in Jordan shows no discrimination as to the region, with the exception of the deserts and the lowlands between ʻAmmān and Wādī al-Mūjib. This region is known to be especially rich in wine presses, very much like the Hauran to the north (Saller and Bagatti 1949: 13-15; Herr *et al*. 1991; Dentzer-Feydy *et al*. 2003).

Generally, the location of installations corresponds to the natural olive tree regions known in modern Jordan, including ʻAjlūn, as-Salṭ and Abila, but also the Petra region. The Petra region has at least four main locations. In 1979 F. Zayadine discovered a crusher and weight dated to the Byzantine period at Zurrābah (Zayadine 1982). Between 1996 and 2000 Dr ʻAmr excavated several elements of oil presses dated to the Nabatean-Roman and Ayyubid-Mamluke periods at Wādī Mūsā and Kh. an-Nawāflah (ʻAmr and Momani 2001; ʻAmr 2000). Also, in 2000 the Swiss-Liechtenstein team



2. Olive oil installations in Jordan (first century BC - eighth century AD) (M. Puszkarski).

unearthed a component of what seems to be the oldest press from the Nabatean period at az-Zanṭūr IV (Kolb and Keller 2001).

The aṭ-Ṭafīla region is marked by the presence of three olive oil installations, located in Wādī la'bān at the Nabatean-Roman site of Kh. adh-Dharīḥ (FIGS. 3-5). Two presses are located within the village, whereas the latest one occupies a room adjacent to the main temenos of the former temple (Muheisen and Villeneuve 1990). During his surveys of the aṭ-Ṭafīla-Buṣayra sector, B. MacDonald noted a huge limestone crusher at Site 045 (MacDonald 2004: 196, fig. 12) and in 1999 A. Abu Shmais saw another crusher in Wādī al-Mūjib (Abu-Shmais 2000).

We owe the discovery of three important oil installations, all dated to the Byzantine or Early Islamic

3. Kh. adh-Dharīḥ. Oil press in the temenos of the temple (T. Waliszewski).

4. Kh. adh-Dharīḥ. Crusher of the oil press in the temenos of the temple (T. Waliszewski).

5. Kh. adh-Dharīḥ. Weight of the oil press in the temenos of the temple (T. Waliszewski).

period, to Jordanian archaeologists working in the area of 'Ammān. One was excavated in 1975-1977 by F. Zayadine (Zayadine 1977/78) at 'Ammān Citadel, close to the Umayyad Palace. An important discovery of a rural, possibly monastic, complex containing a well-preserved oil press, was made in 1995-1996 by Y. Ulayan (Abu Dayyeh 2004). Also, the site of Kh. Yājūz, on the northern outskirts of 'Ammān, has yielded one installation situated in a cave (Thompson 1972) and a small press located in dwellings near the Byzantine basilica (Suleiman 1999).

Two weights of an unusually ancient form were noted by the author close to the Tobiads residence at 'Irāq al-Amīr. Perhaps they belonged to a Hellenistic oil installation, so far unknown. A crusher near a Roman farm, according to the surveyors, was spotted at Kh. al-Wada'ah in Wādī az-Zarqā' (Caneva 2001: 88-89), whilst another crusher lies by the main road at 'Ayn al-Bāshā.

The road taking us to the north passes the area of as-Salṭ, where important discoveries of Roman/Byzantine oil installations were made by S. Hadidi

at Kh. as-Sūq and Jil'ād (Hadidi and Melhim 1998) (FIGS. 6, 7). Unfortunately, the 'Ajlūn region, known for its olives, has only a few crushers and weights without any architectural context. Much richer is Jarash and its environs. J. Seigne has excavated an oil press close to the South Gate of the city. Two others were unearthed by Jordanian archaeologists at Mukhayyam Sūf and Kh. Zuqrīṭ (Seigne 1986: 47-49, pl. VI-VIII).

More recently, P. Watson, during her survey of the Pella Hinterland found, among many wine-presses, components of an olive press at the site of at-Tantur (Watson 2004: 497). The crusher and weight seem to be of Roman-Byzantine date.

Lastly, two further sites have to be mentioned to complete our picture of ancient olive oil installations in Jordan. The American team working in Abila has mentioned an olive press situated in a cave in Area H (Mare 1999: 457-458). To the best of my knowledge, the only installation ever published from the Eastern desert comes from al-Azraq and was excavated at Qaṣr 'Ayn as-Sayl by G. Bisheh (Homes-Fredericq and Hennessy 1989).

6. Oil press installations at Jil'ād (T. Waliszewski).

7. Oil press installation at Jil'ād (T. Waliszewski).

Typology of Installations (FIG. 8)

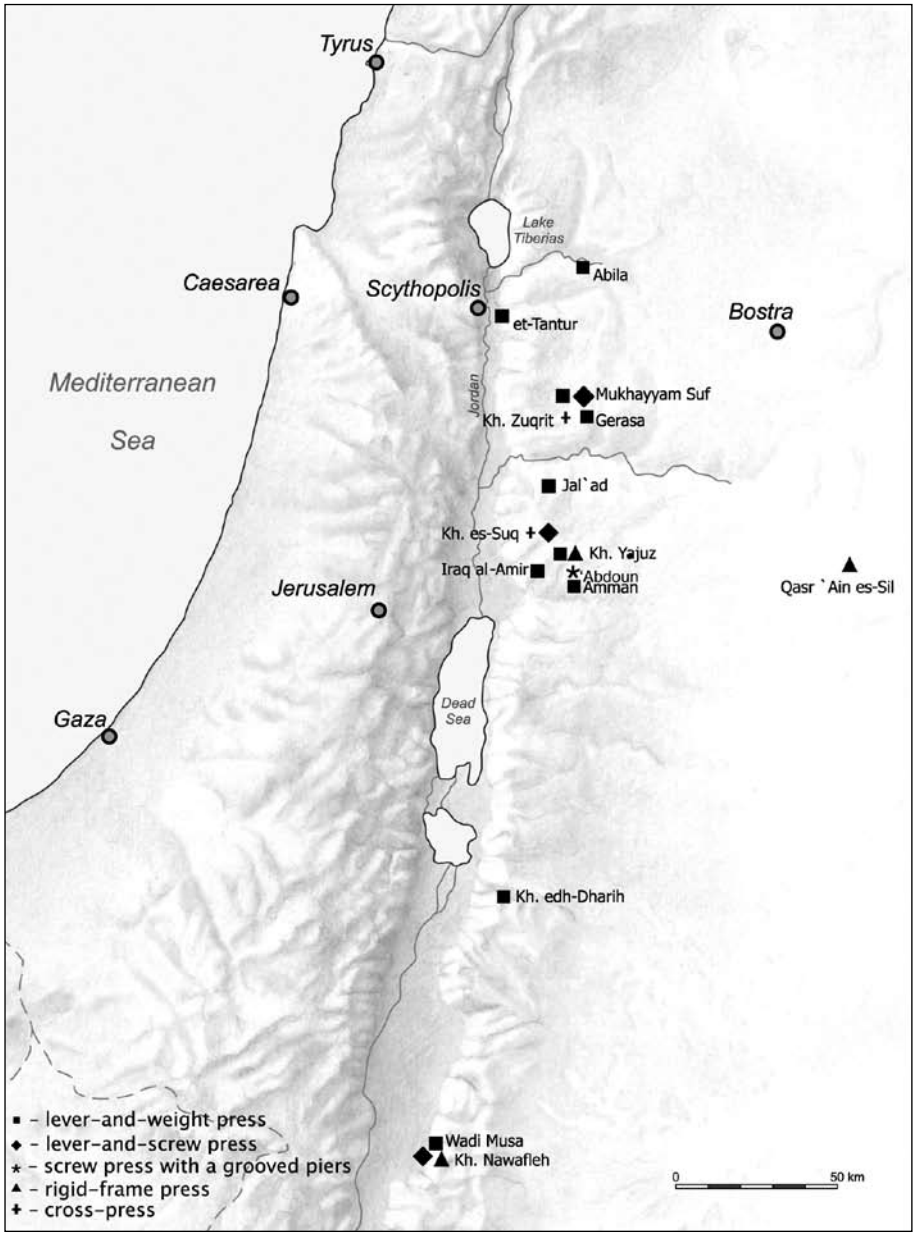
Extraction of oil from olives has always demanded human ingenuity, whether in the form of a relatively simple Bronze Age press or a much more sophisticated Roman mechanism. Thus, the most logical way to build up a typology of olive oil installations is to base it on technical similarities and differences.

Thus, a preliminary list of all known elements of oil presses in Jordan has been created, containing some 64 sites, most of them poorly documented. 33 olive crushers in 7 typological variants were recorded, as well as 71 crushing stones in 9 variants and 38 beam weights in 5 different variants. It is interesting to note that many crushers are composite, built from several sections around a centrally placed monolithic core (e.g. 'Ammān Citadel). Other crushers are monolithic and closely resemble examples from Palestine. Beam weights, an indispensable element of lever-type presses, belong for the most part to one general reversed T-bore type, wide-spread all over the Levant.

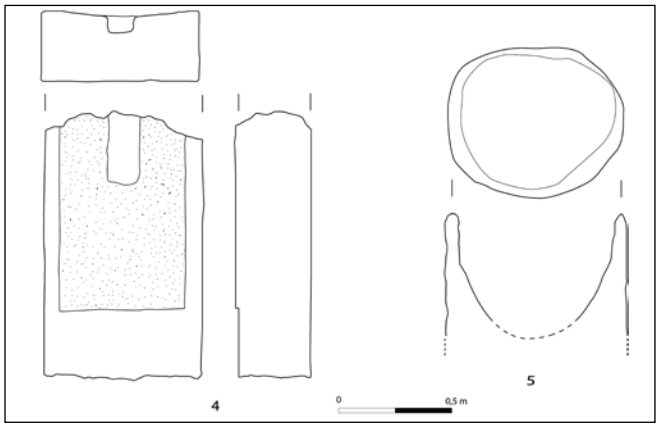
The architectural context for these installations is comprises only 15 buildings or caves scattered all over the Jordan. The chronological spread of the dated examples ranges from the Nabatean period (the earliest known example dates to the second half of the second century BC) through the Roman-Byzantine period and up to the Umayyad-Ayyubid period.

The preliminary typology of the presses corresponds to similar typologies known from Palestine or Syria. The majority of examples (13) belong to the lever-and-weight type. This is the most traditional type, known from several Iron Age and Roman sites in Palestine. A wooden beam is fixed at one end to a niche in a wall, and weights are attached to the other end. Pressure is thus applied to olive paste placed in mats under the beam. Examples of this widespread type are scattered across the country, from Abila in the north to Petra in the south. The building excavated by F. Zayadine at 'Ammān Citadel, may well represent the type described above, although we are missing a few elements of its original furniture. The building was dated by the excavator to the Byzantine period (FIGS. 9-14).

Two other presses (Kh. As-Sūq and Mukhayyam



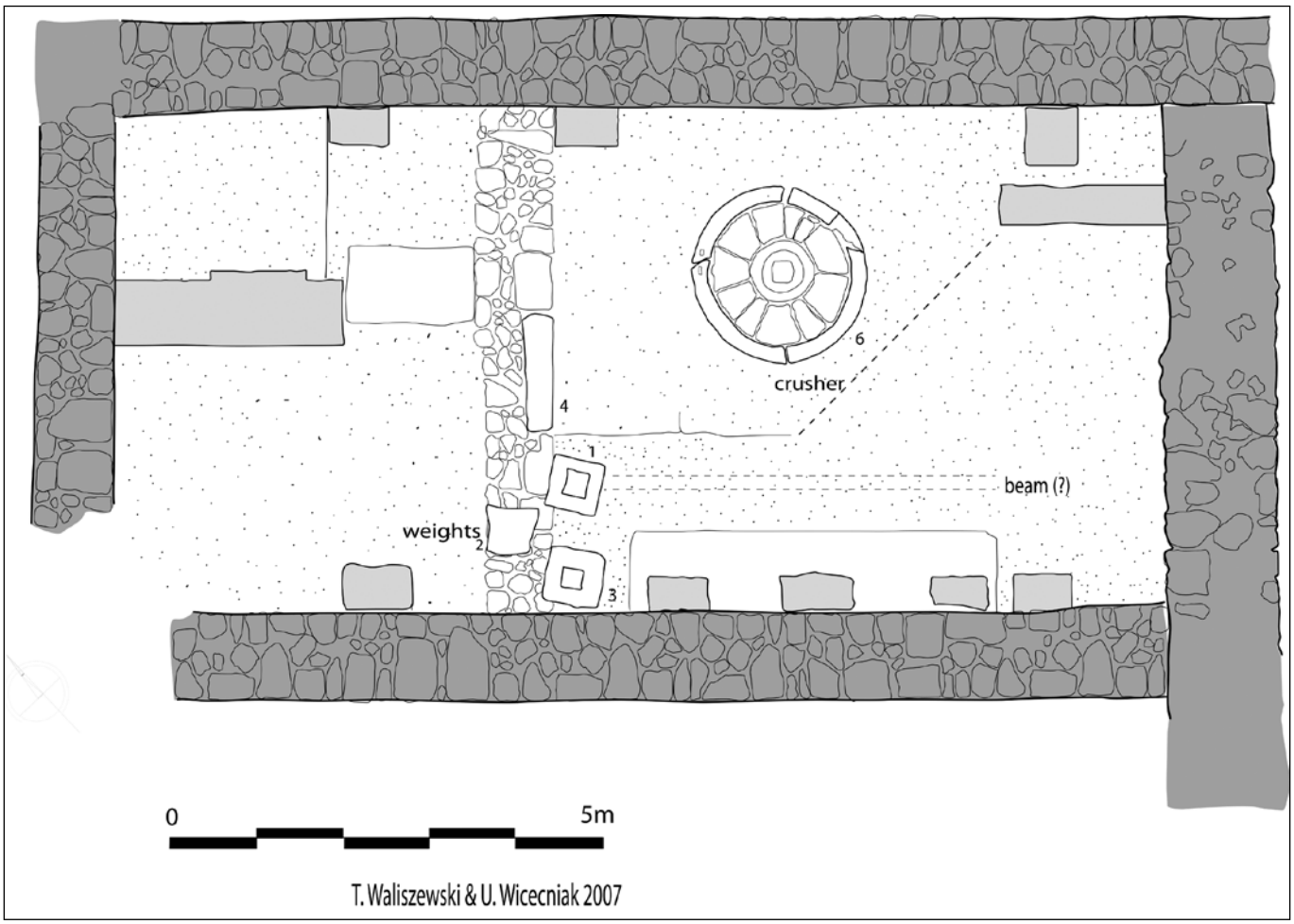
8. Typology of oil installations in Jordan (first century BC - eighth century AD) (M. Puszkarski).



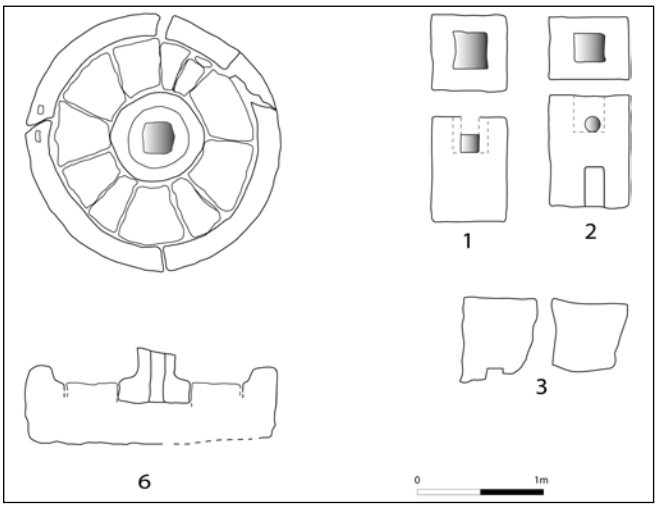
9. Elements of the oil press at ‘Ammān Citadel (U. Wicenciak).

Sūf) belong to a lever-and-screw type, which is a development of the previous type. The only difference between the two is in the force applied to the beam. The weights were replaced by a huge block to which a wooden screw was attached. It moved the beam up and down and, unlike the weights, was easy to operate. This innovative type of press seems to be introduced in Italy in the first century AD and thus belongs, chronologically, to the Roman period. In the Levant similar solutions were introduced during the second-third century AD, but never truly replaced the traditional lever-and-weight press (FIGS. 15-18).

The application of a wooden screw to the olive



10. Oil press at ʻAmmān Citadel (U. Wicenciak).



11. Elements of the oil press at ʻAmmān Citadel (U. Wicenciak).

12. Oil press at ʻAmmān Citadel (T. Waliszewski).

press installations eventually resulted in yet another development: a screw press with grooved piers where pressure was applied directly to the stacked mats with paste placed between two monolithic blocks. The majority of examples are concentrated in Byzantine Judaea; thus the type seems to be Palestinian and to have been developed in Late Roman period. The only known Jordanian example was

13. Crusher of the oil press at ʻAmmān Citadel (T. Waliszewski).

14. Weights of the oil press at ʻAmmān Citadel (T. Waliszewski).

excavated by Ulayan in a rural, possibly monastic, complex at ʻAbdūn, ʻAmmān (ʻAbu Dayyeh 2004); its proposed sixth century date seems entirely feasible. The main room contains a large crusher and two monolithic piers with a space for mats between them and a small basin for oil (FIGS. 19, 20).

The three types of press described above can be attributed industrial installations, if we take into consideration their size and capacity to produce olive oil on a large scale. The two following examples represent presses of more domestic dimensions, but ones which would still have been capable of producing significant quantities of oil.

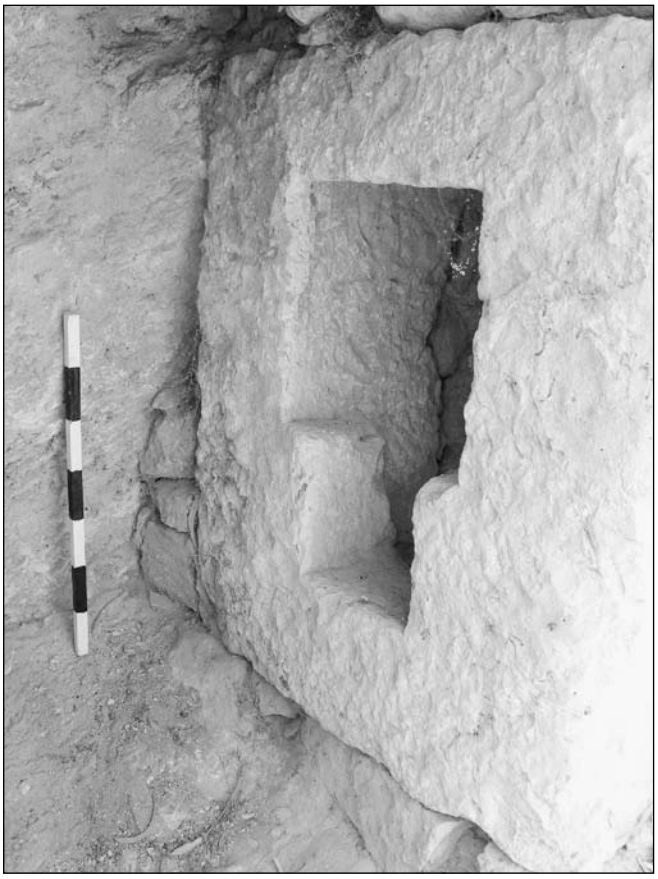
The so-called cross-press is, to date, represented in Jordan by two examples known from Kh. Zuqrīṭ near Jarash. A subterranean room has a large crusher in the centre, with fittings for one bigger and one

15. Oil press at Kh. as-Sūq (T. Waliszewski).

16. Crusher of the oil press at Kh. as-Sūq (T. Waliszewski).

smaller screw-press arranged in the lateral walls. This type is especially well-known from the Byzantine Judaea and seems to have been imported and adapted to the needs of the inhabitants of the Jarash region in antiquity (FIGS. 21, 22).

The rigid-frame type, where a wooden screw is fixed to the stone base, has been recorded in Jordan



17. Niche for the beam at Kh. as-Sūq (T. Waliszewski).

19. Oil press at ʻAbdūn, ʻAmmān (T. Waliszewski).

18. Screw-weight at Kh. as-Sūq (T. Waliszewski).

in at least in three locations: Kh. Yājūz, Qaṣr ʻAyn as-Sayl and Kh. an-Nawāflah near Petra. The University of Yarmuk expedition found a small base for such a press in one of the easternmost rooms of the so-called ʻpalaceʼ at Yājūz. G. Bisheh excavated another in an Umayyad rural residence at Qaṣr ʻAyn as-Sayl at al-Azraq Oasis, where it was placed in a small room adjacent to the courtyard. All examples are dated to the late Byzantine-early Islamic period and are well known from Byzantine Galilee (FIG. 23).

There is one phenomenon common to all the types mentioned above. They correspond almost exclusively to presses known from Roman and Byzantine Judaea and Galilee. Early presses — like the Nabatean and Roman examples from Kh. adh-Dharīḥ — are less well-represented and differ slightly in their technical aspects from later examples. The lack of any technological innovations that are not known from other regions is also worth underlining.

The results presented above are very preliminary. Several issues closely associated with the oil installations themselves should be also investigated, like the technology of production and its social and economical context. But only regionally-orientated studies, including proper excavation of the newly discovered installations, will lead to a better comprehension of the problem of olive oil production in Jordan.

20. Grooved pier of the oil press at ‘Abdūn, ‘Ammān (T. Waliszewski).

21. Niche for the cross-press at Kh. Zuqrīṭ (T. Waliszewski).

Chronology of Installations (FIG. 24)

Chronology has proved to be the most fragile part of this research. Only a few of the installations have been subjected to regular excavation. Many have been found during rescue excavations or, worse, their archaeological context remains completely unknown.

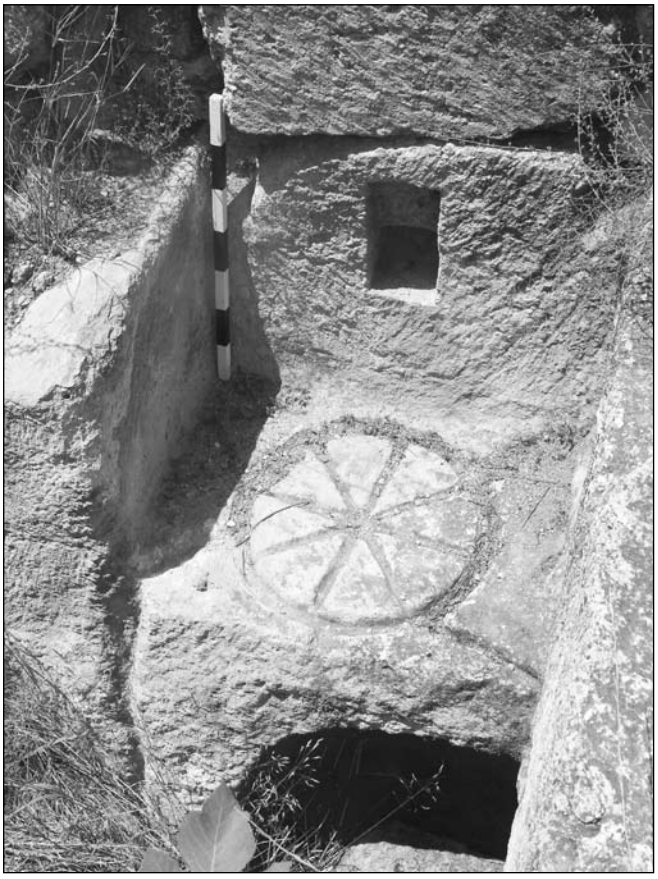
The archaeological evidence available to date allows us to identify Petra az-Zanṭūr IV as the site with the most ancient olive oil installation (taking into account the chronological framework established for this paper). In 2000 the Swiss-Liechtenstein expedition discovered a crusher built into the corner of a Nabatean mansion dated to the second half of the second century BC or the early first century BC (Kolb-Keller 2001: 318-319). Rescue excavations carried out at Kh. an-Nawāflah and Wādī Mūsā by Dr ‘Amr suggest that the oil installations discovered there should be dated to the early first century AD (‘Amr 2000: 239) or, possibly, the late first century AD (‘Amr and Momani 2001: 265).

Nabatean-Roman olive installations have been excavated in Kh. adh-Dharīḥ by the French-Jordanian team. Securely dated by the pottery, oil press V10 existed there in the late first or early second century AD (Muheisen and Villeneuve 1990). Unfortunately, the majority of published installations have only been ascribed to general periods. Jil‘ād, Kh. Zuqrīṭ and Abila to the Roman-Byzantine, Kh. Yājūz tomb to the Byzantine, Qaṣr ‘Ayn as-Sayl to the Umayyad and Kh. an-Nawāflah to the Ayyubid-Mamluke periods.

Towards a Conclusion

Despite a significant gap in the scholarly literature pertaining to the production of olive oil in Jordan during antiquity, traces of oil press installations are scattered across the land, from Abila to Petra, from the Nabatean to the Early Arab periods.

The picture that emerges from this very preliminary report confirms the importance of olive oil in the ancient economy of Jordan. We should however be aware that only regional studies, involving the systematical excavation of newly discovered installations, would make a more meaningful contribution to our knowledge of this important branch



22. Cross-press at Kh. Zuqrīṭ (T. Waliszewski).

23. Rigid-frame press bed at Qaṣr ʻAyn as-Sayl (T. Waliszewski).

of ancient agriculture. The lack of regular excavations has led to a situation in which the chronology of many of the installations remains uncertain.

This preliminary typology of installations known from Jordan corresponds to similar typologies already established in Palestine and Syria, and has particularly close parallels with the types known from Palestine. The majority of examples belong to the lever-and-weight type, two more to the lever-and-screw type; one to the screw-press with grooved pier type; two to the so-called cross-press type and six others to the rigid-frame type. Strikingly, the predominance of the lever-and-weight type of press links Jordanian territory to the Judean and Galilean sphere of technological development, where lever-and-screw presses — known mostly from western Galilee and Phoenicia — are almost absent. We should also note the presence, in the region of Jarash, of cross-press types typical of Roman and Byzantine Judea and Galilee. Also worth underlining is the lack of any independent technological innovation unknown in other regions.

The close parallels observed between the late antique olive oil installations in Jordan and Palestine shed new and innovative light on the history of local technology and demonstrate the close links that existed between both sides of the Jordan River.

Acknowledgments

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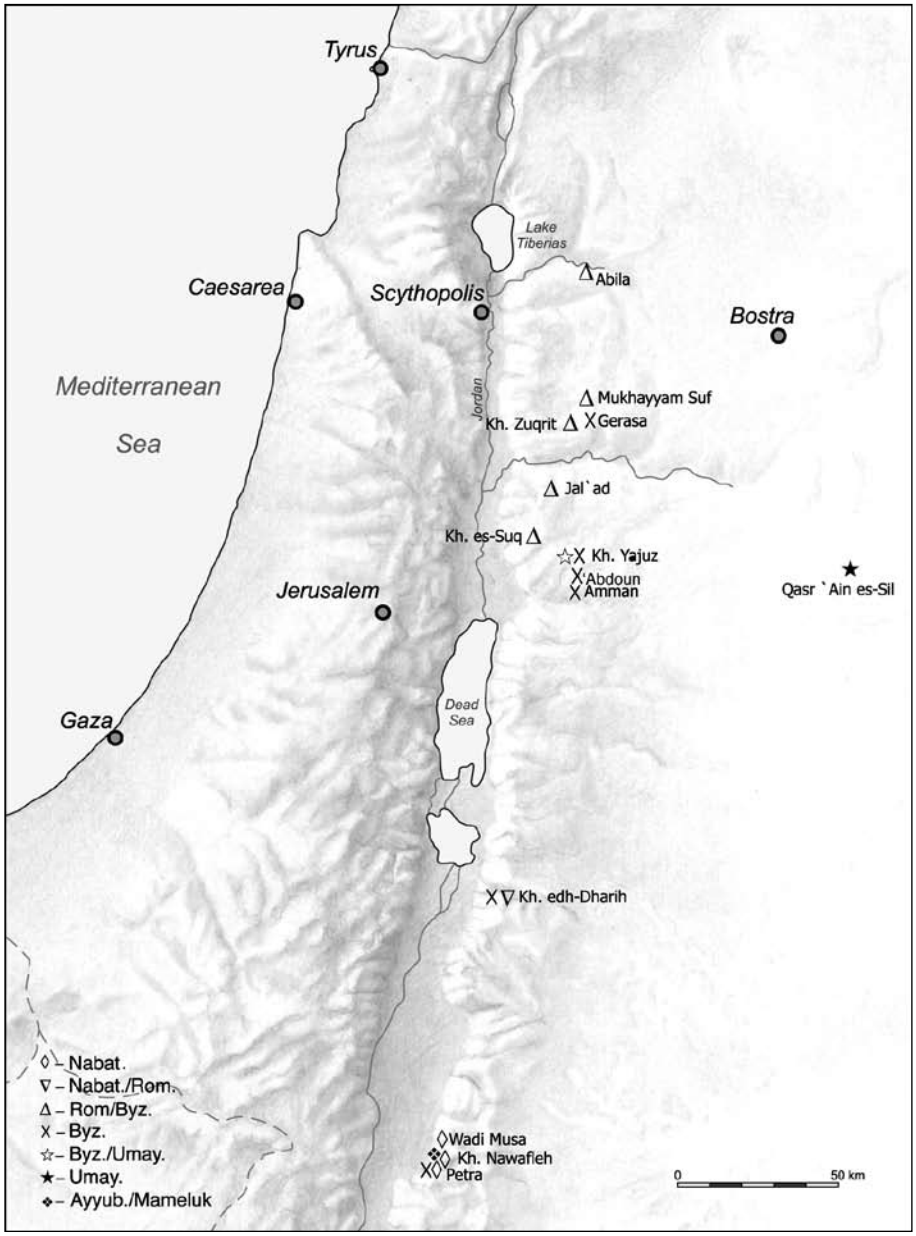

24. Chronology of oil installations in Jordan (first century BC - eighth century AD) (M. Puszkarski).

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