

Olive and Olive Oil Production in Ancient Jordan: Contextualizing the Evidence

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ABSTRACT

Jordan - as a part of the eastern Mediterranean region- played over the ages a vital role in understanding the history of olive cultivation and oil production. The archaeological contexts of different sites in the country shed light on the development of olive oil technology, and its socio-economic contexts. In this paper, a diachronic perspective will be presented to evaluate the techniques that were used in oil production and the changing scale of oil production from domestic to industrial one. Such a changing pattern of production sheds light on the exchange and trade system of olive oil in Jordan throughout antiquity.

Keywords: olive cultivation; oil production; socio-economic context; ancient Jordan.

Introduction

In present day Jordan, as a part of the eastern Mediterranean, olive cultivation has an important economic impact either for the state or households. It can be considered as “Green Gold” for the country in terms of exportation to different parts of the world or for its nutrition and economic values for most of the households, especially rural households. Olive cultivation is an important agriculture cycle of many rural households, which starts from November to January. Olive production is processed (collecting and pressing) during these months (Dalman 1935,4:191f). For these households, these months can be considered as a “feasting” time by which social and as well as economic activities occurred. Olive cultivation represents a social collective work for household members. Accordingly, these months have witnessed more social sharing and exchange among households. Therefore, olive and its oil have a vital economic value in the nutrition aspects as well as for exchange to fulfill other needs of the household. It has been considered, besides other agricultural commodities, as a main product for exchange with urban products such as dried goods, clothes and hardware (Rogan 1999: 99).

The archaeological records in Jordan can clarify the significance of olive culture in term of origin of olive cultivation, techniques used in olive oil production, and the value of olive oil as commodity for trade and/ or exchange (for the classical periods (see Ali 2014). Thus, this study aims at contextualising the olive culture in Jordan from the earliest evidence of its cultivation to the end of the Iron Age (ca. 539 BC). Evidence will be presented in terms of archaeobotanical remains such as olive stones, or archaeological features and installations such as presses. Textual evidence will be encountered in the general discussion of the theme. However, the culture context of the olive oil production will be explored in accordance with the changing socio-economic context over times that correlated with olive cultivation.

1- The diversity of Jordan environment

Despite its small geographic area (ca. 90,000 km²), Jordan has varied environmental zones. These include from west to east the Jordan Rift Valley, the eastern highlands, the plateau and the Badia (fig. 1). Such environmental variation at the present -day can draw a pattern on the spatial distribution of olive plantation context.

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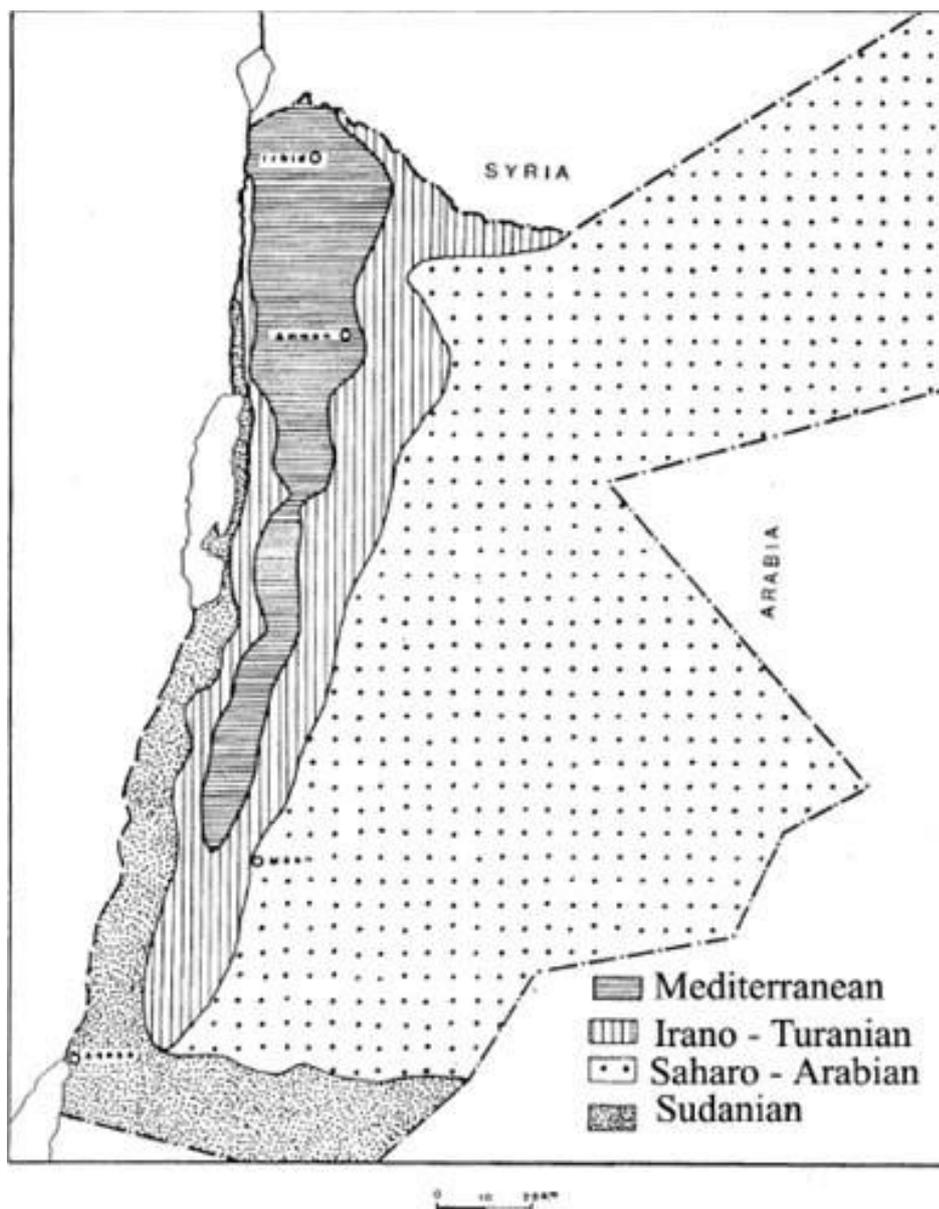


Fig.1: Different climatic regions in Jordan (al-Eisawi 1985:51)

In the normal environmental situation; olives can be cultivated in areas having 300 annual average rainfalls. This can be found in areas such as the eastern highlands, and partly in the plateau, which belong to sub-humid Mediterranean and semi-arid Mediterranean warm bioclimatic regions consequently (fig. 2). However, in the arid Mediterranean bioclimatic region, olive cultivation would be possible with the use of irrigation. Historical geographic data shows that to date the area north of the Az-Zarqa River is a main core area for olive cultivation (Hütteroth and Abdulfattah, 1977:23f., 162ff.). Secondary areas such as the southern eastern highlands and the area adjacent to them can be considered a secondary one for the same agriculture practice, where olives can be cultivated by the employment of irrigation, on a mostly small-scale. In this area, water-springs are used to irrigate olive trees, and the density of olive tree can be seen adjacent to villages.

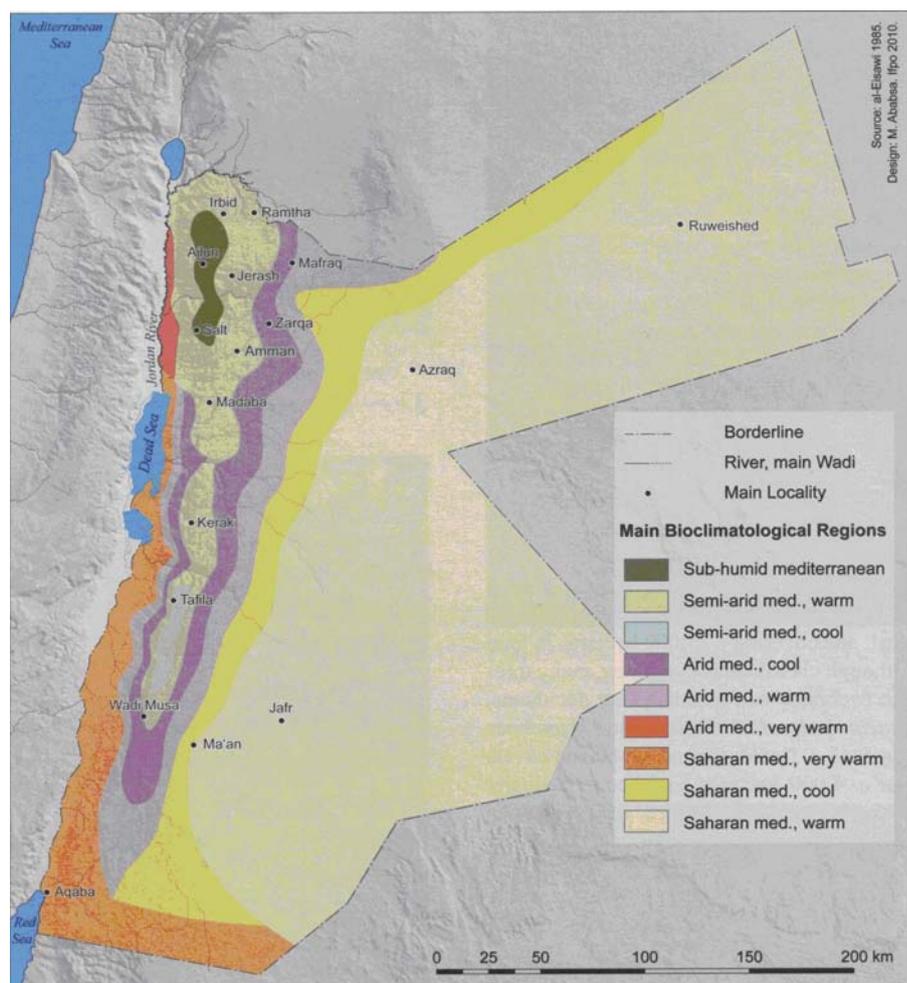


Fig. 2: Major bioclimatological zones in Jordan (al-Eisawi 1985, fig. 8, modified by Ababsa 2013, fig. 1.19))

Nowadays the Jordan environment can draw some conclusions about the spatial distribution of olive cultivation practices. Moreover, it will explore the economic value of olive and olive oil production in ancient Jordan, a practice that still is of special value in the present.

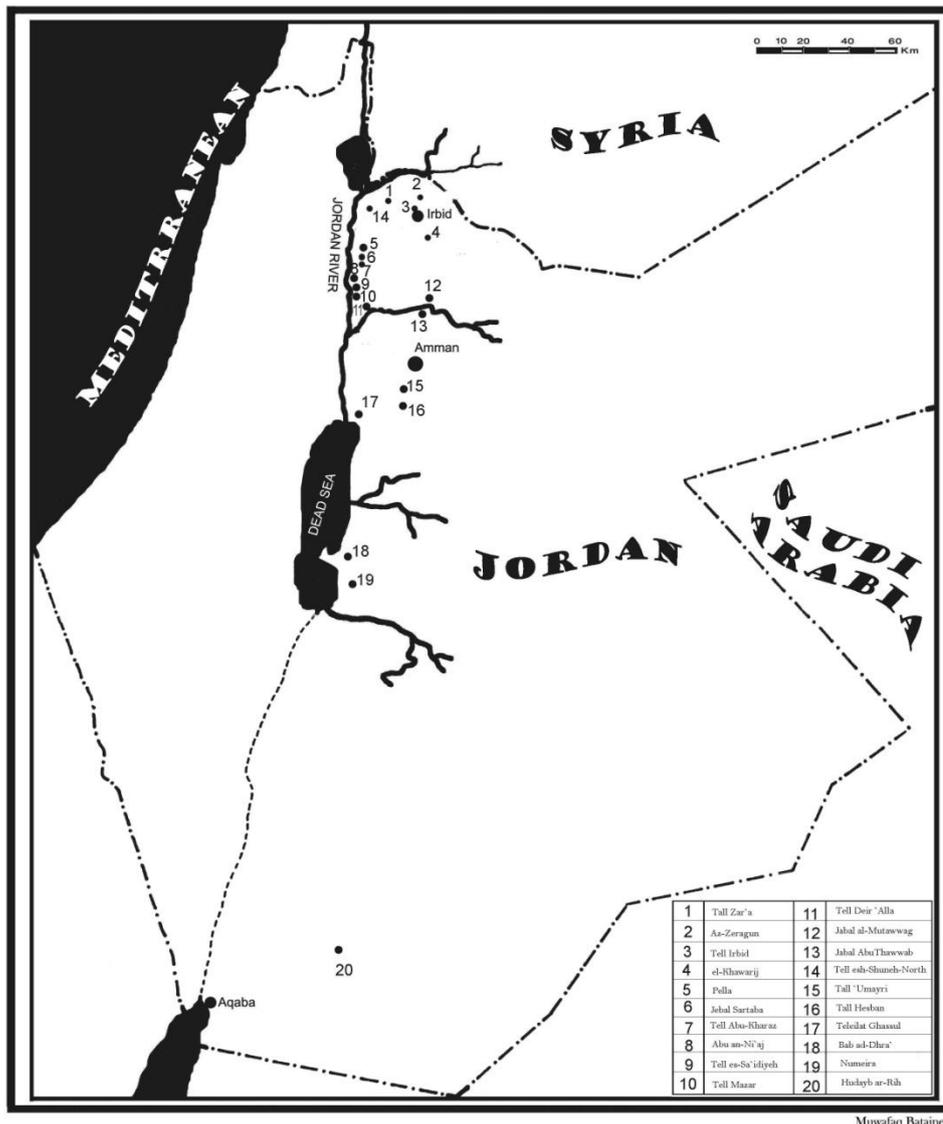
2- Evidence of olive cultivation and oil production in ancient Jordan

Archaeologically speaking, two types of evidence are usually employed by archaeologists to hint at either olive consumption or production. Olive consumption refers to the domestication of olives by means of plantation. Therefore, it hints at human-plant relationship rather than wild olive consumption, because the former sheds lights on the changing pattern of nutrition of past human beings. In this case, olive domestication has cultural and nutrition significances, on the other hand, oil production can be considered as a technological step by which further socio-cultural aims were planned to be achieved; these might include ritual, economic or nutrition aspects.

There have been two aspects of interests with respects to olive will be introduced. Firstly, it will include the evidence of olive domestication or plantation as derived from archaeobotanical evidence. Secondly, it will involve archaeological evidence in terms of installations and features that might hint at oil production. Oil production might be inferred from the presence of crushed olive stones. Archaeological evidence will highlight the technological development of oil production through the ages and the causes or demand of such development.

2.1 The Late Neolithic and Chalcolithic Period

Investigating the origin of olive cultivation has been a special interest for archaeologists working in the southern Levant (Bourke et al 2000, 2003; Liphshitz et al 1991; Lovell 2002; 2010; Neef 1990). Some arguments indicate that it is evidence of changing nutrition pattern for ancient societies or as one of changing settlement pattern and distribution, whereas others point out that it is evidence of economic complexity and interrelations between settlements. However, orchard crops, such as olive, grape or fig, have been used as evidence of what has been termed as “secondary product revolution” (Sherrart 1980; Fall et al 2002).



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Fig. 3: Archaeological sites mentioned in text

Earlier evidence of olive cultivation in the southern Levant has been dated to the late Neolithic period. Botanical remains from late Neolithic sites in the southern Levant show that olive cultivation can be earlier than has been previously thought (Bourke et al 2003). Late Neolithic sites with olive are evidence represented by el-Khawarij in the Ajlun area (Lovell et al 2006; Lovell et al 2010) and Hudayb ar-Rih in Wadi Ramm in southern Jordan (Herveux 2013). The former site is located in what is called the core area of olive cultivation in Jordan whilst Hudayb ar-Rih is situated in arid area. Therefore, it might be that olive was either imported to the site or a shifting pattern of settlement

between the arid and Mediterranean area.

In the early stage of archaeological research, olive cultivation was assumed to have occurred during the Chalcolithic period (*ca.* 4500-3500 BC). In Jordan, olive stones were uncovered at archaeological contexts in sites such as Teleilat Ghassual (**Bourke** et al 2007), Abu Hamid, Tell esh-Shunah North (**Neef** 1990), Jabal Sartaba (**Wilcox** 1992), Pella trench XXXIID (**Bourke** et al 2003), and El-Khawarij, Ajlun area (**Lovell** et al 2010). The botanical evidence from Ghassual is of special interest to address the paleoeconomic changes during the Chalcolithic period. The botanical remains showed that there was an increase in olive exploitation from the early Chalcolithic to Late Chalcolithic. Additionally, **Meadows** (2007:76) argues that olive cultivation was a full arboriculture during the late Chalcolithic period and it even could be that olive oil was produced. The evidence from Ghassual hints at a changing subsistence practices during the Chalcolithic period as a whole, with an emphasis on arboriculture.

It is well accepted that in the context of olive exploitation during the Chalcolithic period, the location of Chalcolithic sites with olive evidence were either in the arid environment of the Jordan Valley or in the Mediterranean, in the northern highlands. Chalcolithic sites are located in arid environment zone, such as in Ghassual and Esh-Shunah North. Olive cultivation in this zone would not be possible without the use of irrigation. Hence the increased economic dependence on olive in the subsistence economy of the Chalcolithic societies was correlated with technical employment of irrigation.

Recently, the evaluation of the relationship between the Jordan Valley and the eastern highlands has been proposed to understand the economic relation among sites in these two environments. Further research was carried out in what could be assumed to be the core area for olive plantation, which is the highland. **Lovell** (2002) proposed a scenario by her excavation in El-Khawarij in the Ajlun area, where olive stones and proper olive oil installation have been uncovered. The changing settlement pattern from the lowlands of the Jordan Valley to the eastern highlands are assumed to be correlated with an increased importance of olive for the subsistence economy of the Chalcolithic societies (**Banning** 2007; **Lovell** 2002).

Olive oil extraction is a parallel economic activity that might be addressed with olive cultivation. The technique by which olive oil was produced during the Chalcolithic period cannot be fully affirmed. However, at the site of El-Khawarij, the excavators correlated rock-cut features as evidence of olive processing. These features date back to 4700-4450 cal BC (**Lovell** et al 2010: 366). The olive stones correlated with these features cannot confirm the cultivation of olive at that early date. However, based on olive evidence and C¹⁴ dates, the site might play a role in olive cultivation around the end of the fifth millennium (*ca.* 5000-4001 BC).

2.2 The Early Bronze Age:

With the outset of the Early Bronze Age (*ca.* 3600 BCE) in the southern Levant, significant cultural transformations occurred. More specifically, it was a time of flourishing of city-state or towns, and the functional interaction between rural or villages and cities (**Fall, Falconer** and **Lines** 2002; **Philip** 2008).

Archaeobotanical evidence of olive cultivation during the Early Bronze Age I (3600-3050 BC) has been uncovered in different archaeological contexts in Jordan. Such evidence was exposed at sites in the highlands of Jordan like Abu Thawwab (**Neef** 1990: 302) or at semi-arid area at Pella trench XXXIID (**Bourke** et al 2003), and Jabal al-Mutawwag (**Velasco** 2008).

Evidence of EB I olive oil press installations can be presented at the site of Tall Rakan 2 in Wadi Ziqlab, in northern Jordan (**Banning** 2007: 222). The installations consist of vats cut in the bedrock, some with interconnecting channels (fig. 4). Interesting are grinding stones represented by mortars and large installation of querns which might be used in olive crushing. Furthermore, in this area, archaeobotanical remains showed that there were olive pits. However, pottery remains in the press area include large hole-mouth jars and short-necked vessels and four-spouted juglets (**Banning** 2007: 222).



Fig. 4: Showing the press installations dated to EB1 at Tall Rakan (Banning 2007: fig. 3)

The case, however, differs with the outset of city-state or urbanism in Jordan (EBII-III, 3050-2300 BC). At this stage, the economic relation between rural sites and cities was more complex, and trade in durable commodities (e.g. olive) increased. It is during this stage that trade or exchange between sites were evolved by exchanging different commodities such as pottery, or cultivated products like olives (Milevski 2005).

During the city-states or urban stage in the southern Levant, olive stones were found at sites such as Az-Zeragun (highland), and Khirbat Qarn al-Kabsh near Madaba (Savage and Metzger 2002: 112, 122). In the Jordan Valley olive pits were uncovered at sites such as Tell el-Hayyat, Bab ad-Dhra", Numeira and Tell Abu al-Kharaz. The evidence of olive cultivation in the Jordan Valley sites such as Bab ad-Dhra' is interesting. At this site, olive remains increase from the EBII to EBIII, which might hint at the increase of the importance of this crop during that time. The presence of olive at Bab ad-Dhra", besides flax, indicates the use of irrigation to cultivate olive (Schaub and Chesson 2007: 250-251). This can explain the presence of olive in this arid area.

Olive oil production during the urban stage in Jordan is evident from direct and indirect evidence. At Tell es-Sa'idiyeh in the Jordan Valley different archaeological installations and features have been uncovered which have been correlated with olive oil production. These include paved floors, storage jars, basins, basalt grinding stones and mortars. Olive oil processing at Tell es-Sa'idiyeh was attached to the palace complex (Tubb 1998). The same installations have been found at the site of Tel Yarmouth in southern Palestine (Salavert 2008: S58).

During the EBIV period (2300-2000BC), olive stones have been uncovered at Bab ad-Dhra', and Tell el-Hayyat (Neef 1990). During this period, pottery object such as lamps with four nozzles have been found. The production of lamps might be used as indirect evidence for the usage of olive oil for lighting.

2.3 The Middle and Late Bronze Age

The Middle Bronze Age (2000-1550 BC) in the southern Levant witnessed the return of moist climate conditions after the arid climate of the Early Bronze Age IV (Palumbo 2008). The spatial distribution of plants remains of olive pits seems to be affected by the climate conditions during the Bronze Age. For example in the Dead Sea basins, at the site of Zahrat adh-Dhra' 1 (MBA) plant remains showed the absence of olive seeds (Fall, Falconer and Edwards 2007: 230).

However, the significance of culture context of olive cultivation would be better understood during the Middle Bronze Age. The Jordan Valley presents an economic value of olive in a time of evolving trade either at regional or

interregional scale. The site of Tall al-Hayyat showed the increased importance of olive during the MBA, compared with the nearby site of Abu an Ni'aj during the EBIV. The excavators explained that as a result of increasing mercantilism during the MBA (**Falconer, Fall and Jones** 2007: 264).

Evidence of olive cultivation during the Late Bronze (1550-1200 BC) has been attested at archaeological sites in Jordan such as Deir 'Alla (**van Zeist and Heeres** 1973: 22), and at Tell Irbid (**Neef** 1990: 302). However, direct evidence of olive oil extraction was not attested in the archaeological contexts of both Middle and Late Bronze Ages.

2.4 The Iron Age

Evidence of olive oil production from Iron Age Jordan (1200-539 BCE) can be attested from three main evidences. These are textual, archaeobotanical and archaeological features and installations. These evidences can clarify the general characteristics of the cultural context of olive oil production.

Ancient texts from Iron Age Jordan with special references to olive oil are scarce. Those are uncovered dated mainly to Iron Age II, especially the 7th century BC., like the text fragments from Umm al-Biyara and Tall as-Sa'idyya (**Ghoul** 2011). These two texts mentioned both olive oil (*smn*) and the vessel of oil (*smm*). It could be argued that these texts highlight the importance of the olive oil for people during the Iron Age.

Archaeobotanical evidence supplements the importance of olive cultivation during the Iron Age. Evidence of olive crops in terms of olive stones has been found in several Iron Age archaeological records in Jordan. These include Deir Alla phase IX, dated to the Iron Age (11-10th century BC) (**Kooij and Ibrahim** 1989: 35-36), and also from the 7-5 the century BC deposits at Deir Alla and from the 6-4 the century BC deposits at Tell Mazar (**Neef** 1990: 302), Tall Jawa, and Tall al-'Umayri and Tall Hesban (**Daviau** 2002: 306-308).

At Tall al-'Umayri a late Iron Age- Persian oil press has been found (**Clark and Bramlett** 2011: 402-3). The press installations consist of stone weights (Fig. 5), and round, flat pieces of limestone (43 cm in diameter and 20 cm thick). The bed is made of plaster, and it is separated from the stone weight by a wall. Moreover, a jar set into a plaster layer was found. The excavators did not consider this jar to be collecting vessels for oil (**Clark and Bramlett** 2011: 403).

Features associated with olive oil processing during the Iron Age came from the site of Tall Jawa. These features are represented by stone vats with hole to facilitate the flow of the expressed fluid into the vat (Fig.6). Interestingly, stone weights have been found also at Tall Jawa which might be a hint of using a lever weight press. But the excavator reports that these stones came from a second floor building, if these weights were used in the press it might be located in an upper storey.

There are a lot of objects that are assumed to be correlated with olive oil storage or production. These include the perforated pithoi, dipper juglets (**Daviau** 2003). However, oil might have been stored in pits paved with stones. Such evidence was found at Tall Zar'a in northern Jordan (**Häser and Vieweger** 2007). It has been assumed that vessels with oil had been stored inside as shown from the stones which have signs of being soaked with oil (**Häser and Vieweger** 2007: 26).

At Kherbit Ras Ez-zatoun pottery types that are assumed to be associated with oil production include hole-mouth jars and cylindrical stands (**Gal and Frankel** 1993: 130).



Fig.5: Showing the stone weight at Tall al-‘Umayri (Clark and Bramlett 2011: fig. 16)



Fig.6: Showing the stone basin used for olive oil processing (Tall Jawa) (Daviau 2003: fig. 8.12),

Discussions

Pollen analysis evidence shows that the vegetation landscape of Jordan went through different dynamic stages. The causes of these stages were either of natural factors or of the role of human interaction with the environment. Scholars argue that the human impact on the environment can be well attested from the beginning of the agriculture practices (**Koehler-Rollefson and Rollefson 1990**). Deforestation has been correlated with the increase of clearing of oak trees for the purposes of land cereal cultivation. Moreover, the need for energy in terms of fuel and raising animals play important factors in the process of deforestation. However, the increase reliance on orchard crop production has been assumed to be a factor that affects the vegetation landscape. Orchard crops cultivation means reliance on fruit trees for economic and nutrition purposes. Cultivation of orchard crops was correlated with the increase in regional or interregional trade. That is, the increase demand of the fruit trees production, e.g. olive and olive oil, date, and grapes. Pollen analysis from different locations in the southern Levant showed that the ratio of olive frequencies increased with the outset of the urban stage, i.e. during the Early Bronze Age II-III. By this period olive was cultivated intensively, which might be correlated with the increase demand for olive products from Old Kingdom Egypt (e.g. **Tubb 1998: 39**). However, olive frequencies declined during the Early Bronze Age IV as evident from pollen analysis evidence

from En-Gedi and the Dead Sea and Galilee basins.

The cultivation of olive in Jordan changed with the outset of the second urban stage of the Middle Bronze Age period until the Iron Age. This assumption can be correlated with the increase of olive frequencies as evident from the Galilee Basin (**Fall** 2002: 471). However, it is worth mentioning that the intensity of olive cultivation during the Middle Bronze and Late Bronze Ages was not the same as the Early Bronze Age.

Archaeological data concerning olive oil extraction showed the technique of oil production through different methods. It can be assumed that the technique used in oil extraction is correlated with the scale of production. That is, the amount of olive that would be pressed. Ethnographic observations in Jordan and Palestine showed that small amount of olive pressing can be carried out with the use of stone or pestle and stone vessel or mortar (**Dalman** 1935, 4: 201). Such a *simple* technique of olive oil extraction could be considered as a means of fulfilling the domestic need for oil. The proper use of such technique can be chronologically related to the Chalcolithic Period. However, the increase in demand for olive oil was related with advances in technological innovation and use. The use of rock-cut features connected with rock-cut vats can be considered a technique of olive extraction. Such a technique, if accepted to be dated to the Chalcolithic Period in the Jordanian Highlands, can be considered related to the increased demand for olive oil. The Chalcolithic Period witnessed the changing scale of olive oil production for trade purposes, e.g. with Egypt.

The Early Bronze Ages (EBI-III) in Jordan witnessed changes in the intensity of olive oil production and the locus of production. At the early stage of this period (EBI) the technique of olive oil extraction seemed to be continued from the preceding Chalcolithic Period (e.g. at Tall Rakan) (**Banning** 2007). Intensity of production remarkably changed during the city-state period (EBII-III). This has been affirmed by the intensity of olive pollen frequencies and olive stone pits. Jordanian sites practiced olive cultivation and oil production as means of trading commodities. Sites in the Jordan Valley played a vital role in the trading network that fulfilled the Egyptian need for olive oil. At the same time, the locus of production seems to be changed due to the uncovering of olive oil extraction installations from EBII Palace at Tell es-Sa'ideyeh. This might be a hint that the locus of oil production was attached to a palace institution. It can be further assumed that olive oil trading was an indication of wealth accumulation.

The economic role of Jordan with respect to olive oil production can be further evaluated during the Middle Bronze Age. Olive oil was an important commodity for trade at the regional and interregional scale. Sites in the Jordan Valley such as Tall al-Hayyat can shed light on such a role (**Falconer, Fall and Jones** 2007). Unfortunately, no single archaeological evidence of olive oil extraction technique has been found to shed the light on the coping of the increased demand for olive oil. This could be relevant to the Late Bronze Age.

The case, however, differs with the outset of the Iron Age, especially the second phase of this period. Archaeological evidence sheds light on the techniques of olive oil extraction. Two main techniques can be identified. The first technique employed the use of treading or roller in a stone vat. The second technique is represented by the use of lever-beam. This technique hints at the industrial scale of olive oil production. The textual evidence from Jordan during the Iron Age II period highlights the importance of olive oil. Moreover, it might be assumed that olive oil production seems to have increased with the demand for oil from the Neo-Assyrian Empire.

Conclusions

Besides its uses for nutrition purposes, evidence from ancient Jordan showed a social and economical significance of olives and olive oil. Social groups have started to harvest olives from the Late Neolithic period. Furthermore, an evidence of olive oil extraction was found during the Chalcolithic period. People have employed different techniques for oil extraction, which might have been changed as the changes occur in the locus of production. Results indicated that locus of production has been transformed from *simple* to *attached* activities, the latter was monopolized by political centre (e.g. the palace). However, during the Iron Age, additional evidence of large scale of olive oil production was found; which can be described as a production at an industrial scale (the use of level beam technique). The intensity of olive oil production in Jordan could highly indicate the importance of Jordan role in the regional and interregional trade system.

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زراعة وانتاج زيت الزيتون في الاردن في العصور القديمة: تأطير الادلة الاثرية ومحتوياتها

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ملخص

يقع الاردن في الاقليم الشرقي للبحر الابيض المتوسط، مما مكنه من لعب دروا مهما عبر العصور القديمة لفهم تاريخ زراعة و انتاج زيت الزيتون. فقد زودتنا المحتويات الاثرية المختلفة التي عثر عليها في الاردن بالادلة على تطور التقنيات المستخدمة في انتاج زيت الزيتون وكذلك ساعدتنا في فهم المحتوى الاجتماعي والاقتصادي لهذه العملية. ان العمق الزمني للاردن ومن خلال الادلة المتوفرة تلقي الضوء ليس فقط على تقنيات الانتاج لزيت الزيتون وانما ايضا على التغير في نمط الانتاج من مستوى الوحدة المنزلية الى الانتاج التصنيعي. بحيث ساعد ذلك على فهم انماط العلاقات التجارية المرتبطة في انتاج زيت الزيتون سواء بين المراكز الحضارية المحلية ام الخارجية.

الكلمات الدالة: زراعة الزيتون، انتاج الزيت، المحتوى الاجتماعي والاقتصادي ، الاردن في العصور القديمة.

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