

# Identification of the Miniaturised Garden of King Herod the Great: The Fossil Pollen Evidence

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*This study reveals the flora of the well-preserved ionic courtyard garden of the Third Winter Palace in Jericho of King Herod the Great, based on the identification of fossil pollen. The garden's peristyle displays some of the finest architectural and artistic remains known in the gardens of the Roman world (Netzer 2001; Rozenberg 2008). Archaeological excavation exposed seven rows of as many as 11 planting pots each within the courtyard garden. The pollen finds from the garden soil and the planting pots include pine, cypress/juniper, cedar, olive, oriental plane, myrtle, bay tree and date palm. All of these trees and shrubs are well-known ornamentals in elite gardens of the western Roman world. Since these naturally large plants were grown in planting pots, it is suggested that the garden featured dwarfed trees. The location of this unique garden in an extreme desert landscape expressed to visitors Herod's power and affluence, not only in ruling his subjects but also in controlling natural forces.*

## Keywords

Jericho, Judea, Herod, gardens, horticulture, palynology

## 1. INTRODUCTION

Herod the Great (73–4 BCE), the Roman client king of ancient Judaea (**Figure 1**) considered to be its greatest builder-ruler, enlarged the palace complex established by the Hasmonaeans on the site of the extensive irrigated *paradeisoi* (groves) along Wadi Qelt, near (but outside) the ancient oasis of Jericho. Located less than 20 km east of Jerusalem, the palace was designed for use during the winter months when Jerusalem at ~ 700 m above sea level, was quite cold while Jericho at ~ 400 m below sea level, was warm and the wadi flowed with water. Herod's palace was built in three stages, the third and final one (15–10 BCE) being the most elaborate (Netzer 1977; Gleason 1987; Netzer and Laureys-Chachy 2004).

Excavations of the winter palaces were conducted by J. Kelso, D. Baramki and J. Pritchard in the 1950s (Kelso 1950), and by E. Netzer from 1973 until 1987 (Netzer 2001). Both excavation campaigns identified garden areas of the palace complex through the discovery of dozens of perforated ceramic vessels



Fig. 1. Map of the Roman Empire during the 1st century BCE–early 1st century CE, including Herod's realm in Judaea. Drawn by M. Cavanagh.



Fig. 2. Planting pots from Jericho. Photo by M. Suchowolski, courtesy of the Israel Museum, Jerusalem.

(*ollae perforatae*) found in situ (**Figure 2**; Gleason 1993; Gleason and Bar-Nathan 2013). These planting pots are known from ancient texts from the 4th century BCE to the 4th century CE (for example, Theophrastus, *Historia Plantarum* 4.4.3, 6.7.3; Pliny the Elder, *Natural History* 17.11:64; Jashemski 1979–1993; Macaulay-Lewis 2006a, 2006b). The pattern of these buried *ollae perforatae* enabled archaeologists to reconstruct the basic design of Herod's gardens in Jericho (**Figures 3–4**; Gleason and Bar-Nathan 2013). The majority of the planting pots found thus far are concentrated in the Ionic peristyle courtyard (7.5 x 16.5 m) also known as Area B64 (**Figures 3, 5 and 6**; Gleason 1993; Gleason and Bar-Nathan 2013). The garden featured seven rows of as many as 11 pots each (with several additional pits instead of pots; **Figure 7**). Visitors viewed the garden from a colonnaded walkway, 2.5 m wide, on three sides, as well as an unusual walk around the perimeter of the garden proper. On the fourth side, a lofty hemicycle connected the garden to a

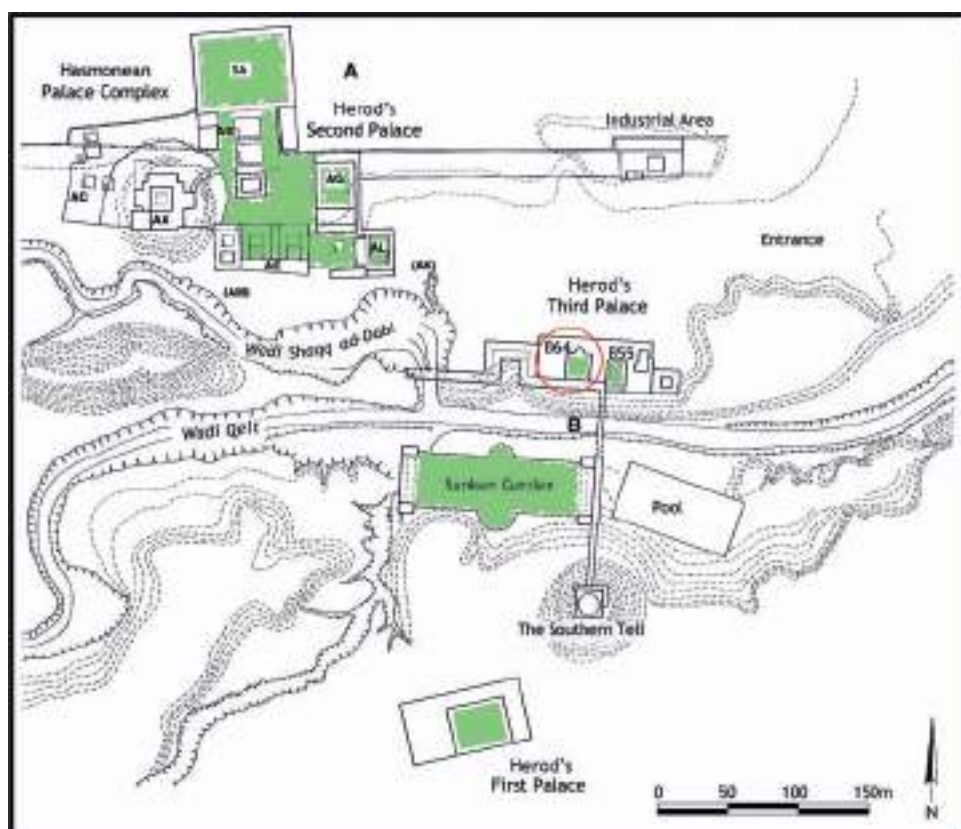


Fig. 3. Location of garden areas in the Winter Palace Complex in Jericho. Image by K. Wilczak and K. Gleason, *after* E. Netzer 2001: plan 2 (previously published in Gleason and Bar-Nathan 2013, fig. 16.2).



Fig. 4. In situ planting pot. Photo by K. Gleason.



Fig. 5. Ionic peristyle of Herod's Third Palace after preliminary excavations by Netzer, with *opus reticulatum* walls visible in the background. Courtesy of the Ehud Netzer Archives.



Fig. 6. Ionic peristyle during excavations in 1985 showing trenches and soundings for planting pots. Courtesy of the Ehud Netzer Archives.

small but very fine hall. This area of the palace was constructed in a combination of Roman *opus reticulatum* and local mudbrick techniques and finely painted and stuccoed. The peristyle and hall were ornamented in rare and expensive colours, with moulded stucco decoration that included vegetal motifs. Rozenberg, who has studied hundreds of fragments of stucco and wall paintings from this complex, noted that it was the most sumptuously painted space in the palace (Rozenberg 2008), competing with the décor of the finest garden peristyles in the early Roman world (Netzer 2001; Rozenberg 2008).

The planting pots provide evidence for the husbandry of gardens in a particularly harsh environment. The fabric of the *ollae perforatae* would have helped conserve water, while the small size would constrain tree growth by preventing vigorous new annual shoots (Ismail and Davies 1998; Passioura 2002). Yet, the exact type of plants that grew in Herod's planting pots has remained an enigma.

Thus far, the majority of *ollae perforatae* from Judaea have been exposed in the Winter Palaces at Jericho (Gleason and Bar-Nathan 2013). Two planting pots were recovered from En-Gedi (Stiebel 2007) and several have been found nearby at Petra (Macaulay-Lewis 2006b). These ceramic vessels were commonly used throughout the Hellenistic and, particularly, the Roman world, from Britain to Egypt (Jashemski 1992, 2018; Macaulay-Lewis 2006a, 2006b; Kenawi, Macaulay-Lewis and

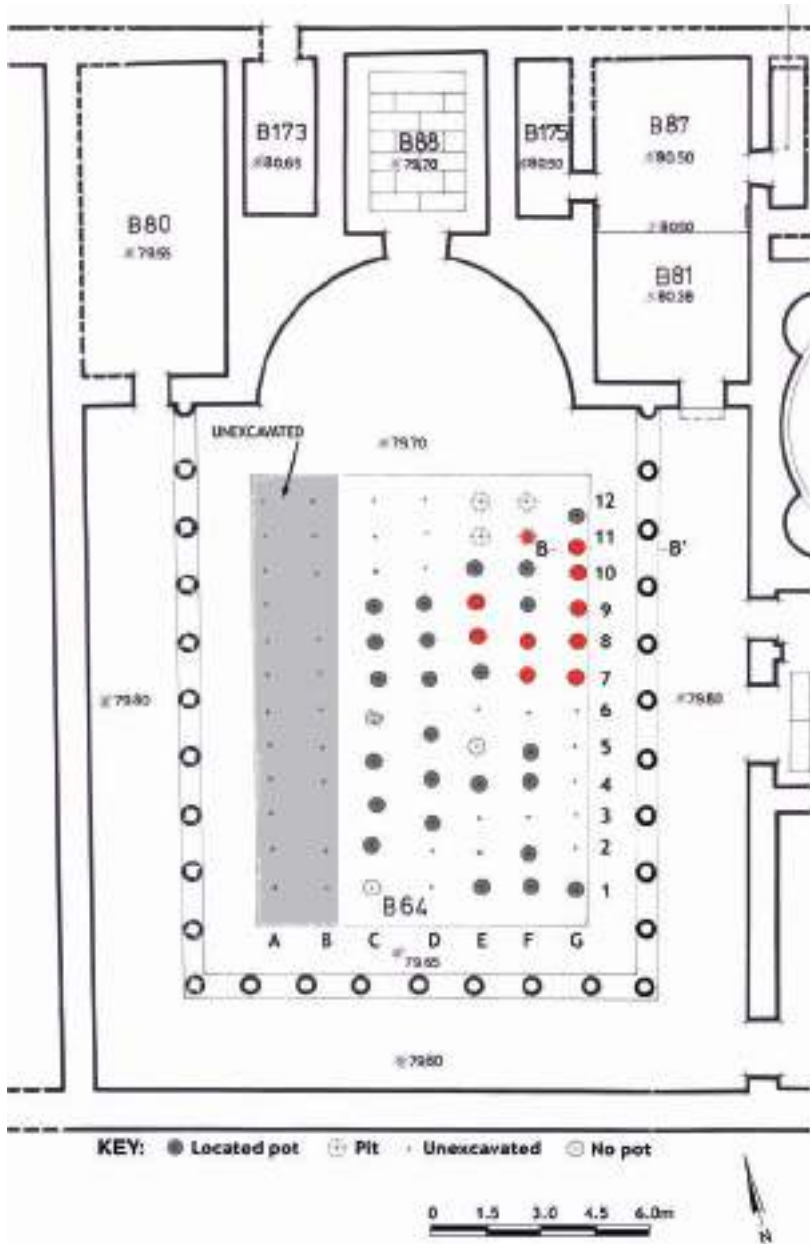


Fig. 7. Ionic peristyle courtyard B64, Herod's Third Palace at Jericho, showing the location of the planting pots and pits. The courtyard included seven rows of up to 11 pots each (with several additional pits instead of pots). The grey circles represent excavated pots, and the red circles represent planting pots analysed in this study (after Gleason and Bar-Nathan 2013, fig. 16.18).

McKenzie 2012). They were normally locally-produced (e.g. Kenawi, Macaulay-Lewis and McKenzie 2012), as is the case of the planting pots from Jericho (Yellin and Gunneweg 1989). Planting pots appear in abundance during the reign of Augustus. Large numbers were found in the villa of Livia *ad gallinus* at Prima Porta, near Rome, as well as around the shrine to his victory in the Battle of Actium, near the town he founded in 29 BCE, Actia Nicopolis (Zachos 2003). At Prima Porta the *porticus triplex*, a monumental three-sided portico, featured extensive remains of planting pots whose layout was destroyed by ploughing. Preservation was better in the small peristyles within the villa, where archaeologists found evidence of replanting, as new *ollae perforatae* were set on top of old ones (Klynne and Liljenstolpe 2000). *Ollae perforatae* typically have a large hole in the base and a number of holes in the sides, the shape and placement of which vary around the empire. The Jericho pots are closest in form to those at Nicopolis (Gleason and Bar-Nathan 2013). The ancient sources describe the use of these perforated pots to propagate shrubs from seed or by aerial layering, and relate that the pots with their plants were then transported and placed in the ground with the plant (Pliny the Elder, *Natural History* 17.21:97).

It is important to note the small size of these planting pots. The purpose-made pots range in size from 12–22 cm. Reused amphorae are also common, although primarily after the 1st century CE, and are larger. We need not assume that the tiny size of the pots indicates flowers or herbaceous plants. Excavated in situ pots from Pompeii and Oplontis, where casts could be made of the roots, showed plants growing out of the pot at the full diameter of the pot's rim, c. 7–9 cm (**Figure 8**;



Fig. 8. Planting pot from Oplontis with cast of large root cavity within the vessel. Courtesy of the Wilhelmina and Stanley Jashemski Archives, University of Maryland.

Jashemski 1992). Gleason noted a root cavity in one of the pots from garden B64, which she cast in latex. The results suggest that the pot had been used for aerial layering, as the latex cast preserved a branch running through the centre of the pot down to the bottom hole, with roots extending to the sides of the pot and the side holes (Gleason 1987).

Since pollen tends to be well preserved in arid environments (e.g. Horowitz 1992), we assumed that the sediments of the garden-soil of the B64 peristyle courtyard would be excellent candidates for pollen investigation. Palynological studies performed at gardens of the western Roman world tend to suffer from complex interpretations due to the challenges of ascertaining the exact source of the pollen grains: on one hand, the palynological spectrum may represent what actually grew in the garden, and on the other hand, pollen grains could originate from the surrounding natural or cultivated environment. A mix of both sources (garden plants and nearby vegetation) is also a possibility, especially in the case of wind-pollinated woody taxa (e.g. Mariotti-Lippi 2000; Dumbleby and Gröger 2002: 183; Mariotti-Lippi and Bellini 2006). Fortunately, finding significant amounts of pollen grains of ornamental trees from Mediterranean habitats at an archaeological site located in the desert leaves no doubt about their origin (Langgut *et al.* forthcoming). In this study, we present our successful palynological examination of the sediments recovered from the garden soil and the planting pots of Area B64, which has enabled us to reconstruct the botanical components of the ornamentally exquisite Ionic peristyle courtyard of Herod's Third Palace in Jericho.

## 2. MATERIALS AND METHODS

### 2.1. Field Sampling Strategy

The archaeologists of the major campaigns did not perform environmental retrieval for plant remains. However, in 1985, Netzer invited Gleason to carry out methods of environmental archaeology in the gardens of the Third Palace. She defined the soils of the garden beds and used bucket flotation to retrieve carbonised plant remains. These yielded charcoal evidence for local desert trees such as *Tamarix* sp. (tamarisk), and *Ziziphus* sp. (Rowena Gale pers. comm.). These woody-plant remains were interpreted as fuel, based on their integration with other typical components of soil fertiliser: carbonised olive seeds (pits of *Olea europaea*) bits of pottery, bones, and shell (Rowena Gale pers. comm.; Gleason 1993; Miller and Gleason 1994: 27–31). Samples for palynological investigation were also taken by Gleason during the 1985 and 1987 seasons from the B64 courtyard. Samples were collected when the garden soil surface above a planting pot was first identified (**Figure 9**). For a better understanding, in each case, another nearby sediment sample (also assumed as the garden soil, but not directly above a planting pot, but a few centimetres away) was also taken. The samples were not processed at the time

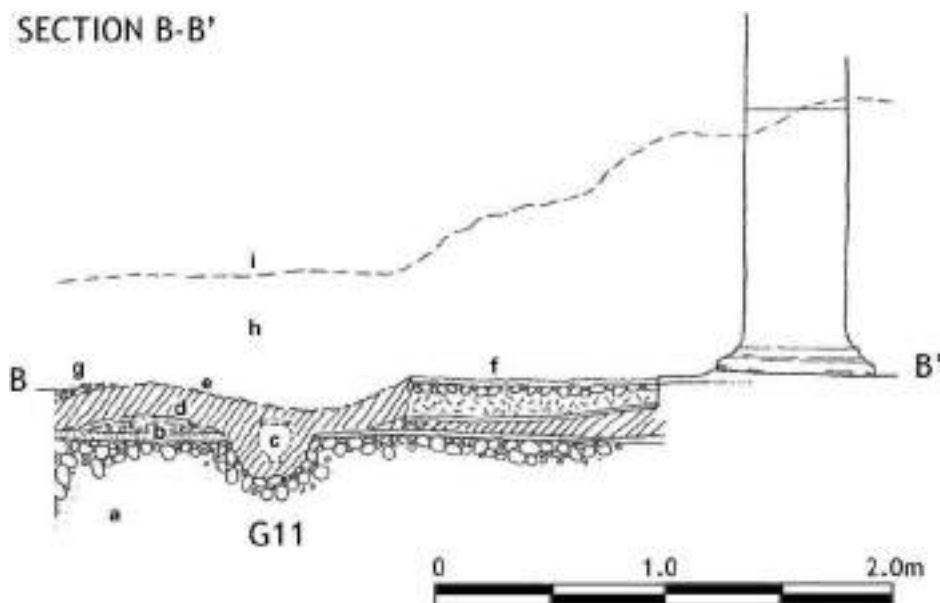


Fig. 9. Section through the B64 peristyle courtyard: (a) gravel subsoil; (b) working surface; (c) planting pit; (d) planting pit; (e) ridges; (f) contoured garden-soil surface; (g) sidewalk; (h) alluvial deposit; (i) fallen building debris. Drawn by K. Gleason (previously published in Gleason and Bar-Nathan 2013, fig. 16.21).

due to advice that insect penetration of the relatively shallow site made successful processing unlikely (G. Dimbleby pers. comm.), but as we shall see, this proved not to be a concern. In total, 18 samples (nos. 1–18) were collected related to nine different planting pots (E8, E9, F7, F8, G7, G8, G9, 910 and G11; **Figure 7**). One sample from the garden soil of a pit (F11) was also taken (no. 19). Three samples were collected for control purposes from sediments retrieved from the inner part of the planting pots (nos. 20–22). An additional control sample (no. 23) which represents the recent ‘pollen rain’ was collected from surface sediments, 35 m east of the B64 courtyard. In 2013, the samples were given to the Laboratory of Archaeobotany and Ancient Environments at Tel Aviv University for palynological analyses.

## 2.2. Laboratory Procedure and Pollen Identification

Pollen extraction from sediments followed a physical-chemical preparation procedure: One *Lycopodium* spore tablet was added to each sample in order to calculate pollen concentrations (Stockmarr 1971). Samples were then immersed in HCl to remove the calcium carbonates, after which a density separation was

carried out using a  $ZnBr_2$  solution (with a specific gravity of 1.95) in order to float the organic material, together with 5 minutes of sonication. After sieving (150  $\mu m$  mesh screen) and short acetolysis, the unstained residues were homogenised and mounted onto microscope slides using glycerin. Pollen grains were identified under a light microscope, at magnifications of 200X, 400X and 1000X (oil immersion), to the most detailed possible systematic level. For pollen identification, a comparative reference collection of the Israeli pollen flora of Tel Aviv University (Steinhardt Museum of Natural History) was used, in addition to pollen atlases (e.g. Beug 2004; Reille 1995; 1998; 1999).

All the available pollen grains have been identified and counted from each sample. While in palynological studies related to paleo-climate and paleo-environmental reconstruction, it is necessary to count hundreds of pollen grains for statistical reliability (Faegri and Iversen 1989), in the case of palynological-archaeology the quality approach is used. The numbers of pollen grains in archaeological samples differ from one site to another. The quantity of pollen grains depends on the archaeological context, taphonomic processes as well as on the ecological niche where the site is located. The key to an accurate interpretation of archaeological pollen data depends on analysing several samples from the same archaeological context, to use control samples as well as nearby surface pollen samples (Bryant and Holloway 1983).

### 3. RESULTS

In total, 23 samples were analysed, and their results are presented in **Table 1**. Soil samples from seven out of the nine planting pots contained relatively well-preserved pollen grains sampled from the garden-soil both above and near the pots (sample nos. 1–12 and nos. 17–18). The garden-soil on top of pots G9 and G10 (sample nos. 13–16) was pollen barren, maybe because of preservation issues. The sample from the pit (no. 19) as well as the control samples collected from sediments inside the pots (nos. 20–22) and from surface sediments (no. 23) also included relatively well-preserved pollen grains (**Table 1** and **Figure 7**).

The palynological spectrum from the garden's soil is composed of two main categories: (i) possible ornamental trees and shrubs, and (ii) plants of the nearby natural environment (also termed in palynological studies 'background noise' or 'background spectrum' — Bryant 1974; Dumbleby and Gröger 2002: 183; Mariotti-Lippi and Bellini 2006; Langgut *et al.* 2016). The sediments retrieved from the garden-soil which covered the planting pots and from the pit were characterised by a mixed signal from both categories. However, samples collected right above the pots (in contrast to those taken from a few centimetres near the pots) contained somewhat higher ratios of pollen grains which belong to the first category of

possible ornamental trees and shrubs. The four control samples were dominated by pollen assemblages that derived mainly from the natural environment.

The first category — possible ornamental plants, includes the following taxa (in declining order): *Pinus* (pine), Cupressaceae (cypress/juniper), *Olea europaea* (olive), *Cedrus* (cedar), *Platanus orientalis* (oriental plane), *Phoenix dactylifera* (date palm), *Laurus nobilis* (laurel) and *Myrtus communis* (true myrtle). All of these taxa are trees and large shrubs.

The second category is dominated by the following taxa (in declining order): Chenopodiaceae (goosefoot family), Asteraceae (sunflower family) Asteroideae type (aster-like), Asteraceae Cichorioideae type (dandelion-like), Brassicaceae (cabbage family) and Poaceae (grasses). Common desert plants which appear in low quantities are: *Tamarix* (tamarisk), *Limonium* (sea-lavender), *Ephedra* (Mormon tea), *Crocus* (croci) and Geraniaceae (Geraniales).

## 4. DISCUSSION

### 4.1. Palynological Assemblage and Pollen Origin

All of the suggested trees and large shrubs in the ornamental category are native wind-pollinated taxa belonging to the arboreal Mediterranean vegetation territory of the southern Levant, except the local date palm and the cedar, which are not native to the Israeli flora. The total absence of pollen of other wind-pollinated trees common to the southern Levant Mediterranean maquis/forest such as oaks and terebinth clearly indicates that the pollen of the suggested ornamental trees did not originate from their natural habitats and was transported by prevailing winds, but that the trees were cultivated in the studied area. The category of ornamental plants also includes the shrub (sometimes even small tree) — true myrtle. This taxon, which is also not native to the area of Jericho but to more northern regions, is an insect-pollinated species. It is therefore characterised by low pollen dispersal efficiency and reinforces the idea that this plant was also cultivated as an ornamental in the courtyard. Since each sample is composed of several pollen taxa of ornamental plants which are characterised by different pollen dispersal mechanism, it is impossible to link a specific taxon to a specific planting pot.

The control samples retrieved from the sediments inside the pots clearly help to define the local pollen spectrum (= ‘background noise’) *versus* the cultivated plants. While the former is dominated by natural desert taxa, the latter pollen spectrum is characterised by a mixed signal of ornamental trees and shrubs from a Mediterranean origin combined with common wild desert elements. This is of interest because it appears to rule out the possibility that the pollen came from a plant nursery or another location prior to the planting in garden B64.

	Archaeological contexts								
		E8		E9		F7		F8	
		Above planting pot	Near planting pot	Above planting pot	Near planting pot	Above planting pot	Near planting pot	Above planting pot	Near planting pot
	Pollen taxa								
Possible ornamental trees and shrubs	<i>Pinus</i> (pine)	12	7	1	2		2	7	1
	Cupressaceae (cypress/juniper)			1	3			4	2
	<i>Cedrus</i> (cedar)			4					
	<i>Olea europaea</i> (olive)	1	5		1				
	<i>Platanus orientalis</i> (oriental plane)	5							
	<i>Myrtus communis</i> (true myrtle)			2					
	<i>Laurus nobilis</i> (bay tree)	3							
	<i>Phoenix dactylifera</i> (date palm)	2	1						
Plants of the natural environment	<i>Tamarix</i> (tamarisk)	2							
	Asteraceae Asteroideae type (aster-like)	2	23	6	3	1		7	3
	Asteraceae Cichorioideae type (dandelion-like)	3	1	2	2				
	<i>Centaurea</i> (knapweeds)	0							
	Poaceae (grasses)	1							
	Cereal type								
	Caryophyllaceae (pink family)			1					
	Liliaceae								
	Chenopodiaceae (goosefoot family)	41	91	27	2	4	21	20	13
	Plantaginaceae								
	<i>Mentha</i> type (mint)				1				
	Geraniaceae (Geraniales)	1	1						1
	<i>Ephedra</i> (Mormon tea)		1					1	
	Brassicaceae (cabbage family)	1	10	1				1	
	<i>Limonium</i> (sea-lavender)	1		2					
	Urticaceae (nettle family)					1			
	<i>Crocus</i> (croci)	1							
	Malvaceae								
	Polygonaceae (knotweed family)			1	1				
	Valerianaceae (valerian family)								
<b>Sum</b>	<b>76</b>	<b>140</b>	<b>48</b>	<b>15</b>	<b>6</b>	<b>23</b>	<b>40</b>	<b>20</b>	
Unidentified	22	6	10	7	4	1	29	2	
<i>Nuphar</i>	1								
Spores	51	9		5	7		52		
<i>Lycopodium</i>	821	56	385	330	682	121	971	123	

Table 1. Pollen results from the peristyle courtyard B64 in Jericho.

IDENTIFICATION OF THE MINIATURISED GARDEN OF KING HEROD THE GREAT

Sediment samples from garden soil surface											Other control samples			
G7		G8		G9		G10		G11		F11	E8	E9	F7	
Above planting pot	Near planting pot	Above planting pot	Near planting pot	Above planting pot	Near planting pot	Above planting pot	Near planting pot	Above planting pot	Near planting pot	Pit: cultivation layer	E8 inside pot	E9 inside pot	F7 inside pot	Recent surface sediments
1	9	2							1	5	1			23
	3							1		2		1	2	
2														
1										3			1	
										1				
										2				
	8							1	5	1	1	1	1	3
	1										4	2	1	29
												1	1	44
														27
									1	14	1	1	1	4
										1				1
												1		6
								1				1		2
	22	6						6	2	4	14	4	12	84
												1		1
								1			2	1	1	5
												1		3
													1	9
												1	2	
								1				1		1
										2		1	1	2
	1													
														7
<b>4</b>	<b>44</b>	<b>2</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>11</b>	<b>9</b>	<b>35</b>	<b>23</b>	<b>18</b>	<b>24</b>	<b>251</b>
	14	2						9			4	4		17
1	63	1						13	2	11	1		3	6
55	1215	425	103					1006	82	491	121	51		178

## 4.2. A New Interpretation: Miniaturising the Garden

In the absence of clear archaeobotanical evidence, the first interpretation of the garden relied on literary sources to imagine the peristyle as a simple, aromatic display of the valuable balsam and palm trees that famously grew in the *paradeisoi*, or royal groves of Jericho and the Dead Sea (Gleason 1993). The balsam, in this theory, grew in the pots, while tall date palms in the pits framed the hemicycle and announced the presence of the garden to distant visitors to the palace. This interpretation must now be reassessed in light of the new flora identified in the pollen record.

All of the ornamental plants grown in the B64 Ionic peristyle courtyard of Herod's Third Palace in Jericho are trees or shrubs: pine, cypress/juniper, olive, cedar, oriental plane, date palm, laurel and myrtle (detailed in the next subsection). Most of these plants were grown in the 12–22 cm tall planting pots. Due to the small size of the peristyle garden, and the wide variety of normally large plant species, it is most reasonable to assume that the dimensions of the trees were relatively small; either since the trees were immature and/or, as we believe, due to dwarfing — the horticultural practice just becoming fashionable at that time in the western Roman world. This was achieved through propagation of small varieties or skilled pruning, or both.

Dwarfing of trees was part of the Roman art known as *ars topiaria*, which gives us our modern term 'topiary'. *Ars topiaria*, the art of elite ornamental gardening, encompasses all manner of cut effects: grafting, clipping trees into dwarf forms, pruning and training trees to fit into planters and/or to climb walls, arranging them into scenes, and ultimately (by the 1st century CE) the creation of the kind of shapes and arrangement familiar to us as 'topiary' today (Landgren 2013; Gleason and Palmer 2018: 376). The planting pots played a role of limiting growth in the art of *nemora tonsilia*, dwarfing trees and creating arrangements of the specimens.

Other indications that the size of plants may have been controlled come from sources outside the garden in Jericho, from the western Roman world. Pliny the Elder writes the practice of *nemora tonsilia* was introduced by Gaius Matius during the reign of Augustus (*Natural History* 12.6). A recent study carefully examined Roman paintings and found evidence of the pruning and dwarfing of plants (Gleason 2019). The painted images appear to suggest that the gardeners deployed a range of pruning strategies to control the size and shape of trees and to thin out shrubs for densely arranged, verdant compositions. Pliny the Elder describes the practice of creating dwarf oriental plane trees (*Natural History* 12.6:13; Landgren 2013; Farrar 2016: 168). Ancient texts record plants with the prefix *chamae* which includes dwarfed plants for garden use. Some of the ornamental plants identified in B64 courtyard have such a prefix: *Chamaeplatanus* (dwarf oriental plane), *Chamaezēlos* (dwarf date palm) and *Chamaedaphne* (suggested as dwarf laurel;

André 1984; Gleason 2019: table 1). Following the evidence in ancient literature and wall paintings, it was recently suggested that dwarfed trees were used in the Great Peristyle of the Villa Ariana, based on the close spacing and size of root cavities (Gleason 2019). These peristyle gardens, featuring the art of the *topiarius*, were known as *viridia*, or verdant, and were skillfully created and maintained elite or imperial displays. Larger, more complex collections of *viridia*, known as *viridaria*, are attested in the larger villa gardens and public parks. Flavius Josephus (*Jewish War* 5.4), in describing Herod's palace in Jerusalem, deploys a unique combination of the Greek *chloera* as an adjective on *hypai, which appears to be a translation of *viridarium* (Gleason 2014).*

The *ollae perforatae* within the B64 courtyard, were 'planted', or set in the ground, in ordered rows (**Figures 4, 7**). This simple arrangement allowed the plants to receive enough air and water without battling each other for light, nutrients and water, and without their roots becoming entangled, which would have occurred if they had been placed closely in the ground while they were developing. The location of the garden within an enclosed courtyard helped to protect the plants from the winds and dust storms common in the desert. Although the planting pots assist in conserving water, in order to grow the typical Mediterranean trees that were palynologically identified in this study, an intensive and controlled irrigation system was supplied to the courtyard from nearby water channels to the Third Palace and distributed along the contours of the garden surface. Low ridges under the garden surface helped to direct the water efficiently to the pots and pits. There was also a need to sustain the trees in their unnatural habitat, which probably demanded expert cultivation. The cedar is a case in point since it is challenging to cultivate this tree in a desert environment (Langgut *et al.* in press). Such efforts require expensive maintenance, as well as great patience and a close relationship to each plant over time. The Roman literature of this period indicates that the *topiarius*, in charge of the design and the ongoing shaping and health of the garden, assisted by gardeners and other labourers, would have been given the responsibility for this work. Thus the *topiarius*' set of skills included the knowledge of laying out gardens with appropriate soil, drainage, irrigation, and the conditions required for the success of the plants, as well as the horticultural expertise to prune and shape plants into the desired forms of the genre, without necessarily being the labourer who actually maintained the gardens (Landgren 2013).

The simplicity of the rows of pots may thus be deceptive. Study of gardens and garden paintings in Italy suggests that the arrangement of plants in Herod's garden was designed to be seen not in plain rows of pots with expensive plants, as in Gleason's first interpretation (Gleason 1993), but in varied and novel displays of each plant, arranged in vertical layers, such as a foreground, middleground and background, to be appreciated by strollers walking around the garden or reclining to dine or rest.

Planting pots in the context of elite gardens were abundant in the garden of the House of the Ship Europa in Pompeii, as well as in the garden of the imperial villa of Poppaea (the mother of the emperor Nero) at Oplontis, where a total of 85 planting pots were recovered (Jashemski 2018: 443–44). Many pots (both *ollae perforatae* type and reused amphorae) were also recovered near the Temple of Elagabalus on the Palatine Hill in Rome. Judging from the array of the different planting pots, it seems that the public garden near this temple contained a variety of plants which were kept at a very low height (Gleason and Palmer 2018: 375). Plentiful numbers of *ollae perforatae* were also in use in the royal gardens of Herod's contemporary, Augustus (Zachos 2003; Klynne and Liljenstolpe 2000).

An abundance of ceramic planting pots arranged in a specific order as in the case of the B64 courtyard, were also found in two Roman nurseries: at Pompeii (Jashemski 1979–1993) and near Abu Hummus in Egypt (Riad 1964; Kenawi, Macaulay-Lewis and McKenzie 2012). These sites are interpreted as nurseries for commercial purposes where young plants were propagated and carefully tended until they were sufficiently established to transplant. It is clear from the setting and décor of the peristyle that the abundance of planting pots in rows at the B64 courtyard represent the existence of a luxurious private garden and not a nursery facility.

In total, this evidence defines the garden of the Ionic peristyle courtyard of Herod's Third Palace in Jericho as exceptional amongst known Roman elite gardens in preservation, and in its original design.

### 4.3. THE ORNAMENTAL PLANTS

#### 4.3.1. Pine (*Pinus*)

*Pinus* species are palynologically indistinguishable, yet *Pinus halepensis* (Aleppo pine) is the only pine species native to Israel. It is a characteristic arboreal component of the Mediterranean maquis/forest (Zohary 1973). However, southern Levant Pleistocene palynological records show that *Pinus* was only a minor component of the region (Horowitz 1979; Weinstein-Evron 1983; van-Zeist, Baruch and Bottema 2009; Langgut *et al.* 2011; Weinstein-Evron *et al.* 2015). It was recently suggested that during the Classical periods, Aleppo pine was cultivated in ancient Judaea, mainly for construction enterprises (Roth, Gadot and Langgut 2019). Charcoal remains of Aleppo pine as well as *Pinus* pollen grains were recovered from two gardens in Herodium: from the garden surrounding Herod's tomb, as well as from the courtyard of Herod's fortress/palace (Langgut *et al.* forthcoming). In other ancient royal gardens in Israel, located in the Mediterranean vegetation territory, it is not absolutely clear whether *Pinus* pollen originated from the nearby natural environment, or grew in the garden as an ornamental tree (Langgut *et al.* 2013; Langgut, Gleason and Burrell 2015; Kisilevitz *et al.* 2017). However, in the case

of Jericho's B64 peristyle garden, located in the desert, there is no doubt of its cultivation as a garden tree. *Pinus* pollen is the most dominant tree within the B64 courtyard assemblage. Even though *Pinus* pollen is usually over-represented in palynological spectra (mainly due to its good long-distance transport ability), the high pine pollen frequencies point to its cultivation in the garden. Based on botanical remains and textual and artistic evidence, it seems that in the western Roman world the umbrella pine (*Pinus pinea*) was more common as an ornamental tree in comparison to Aleppo pine (Jashemski, Meyer and Ricciardi 2002: 143–44; Caneva and Bohuny 2003). The miniaturising of coniferous trees in Roman paintings was suggested by Gleason (2019).

#### 4.3.2. *Cupressaceae* (*Cypress/juniper*)

In general, Levantine Cupressaceae pollen includes *Cupressus sempervirens* (cypress) and *Juniperus* sp. (juniper), which are palynologically indistinguishable (Beug 2004). The Cupressaceae family is encountered in Pleistocene fossil south Levantine palynological records (Horowitz 1979; Weinstein-Evron 1983; van Zeist, Baruch and Bottema 2009; Langgut *et al.* 2011; Weinstein-Evron *et al.* 2015). Cypress and juniper wood remains were also recovered from several prehistoric sites (e.g. Lev-Yadun and Weinstein-Evron 1993; Baruch and Goring-Morris 1997). During recent years, Cupressaceae pollen was also retrieved from the palatial courtyard of Herod's Promontory Palace in Caesarea Maritima (Langgut, Gleason and Burrell 2015) as well as from the two royal gardens of Herod in Herodium (Langgut *et al.* forthcoming). At the latter Herodian site, charcoal remains of cypress were also extracted from the soil of the gardens (Langgut *et al.* forthcoming). In these three Herodian sites (Jericho, Caesarea and Herodium), Cupressaceae pollen appears in much higher percentages than in its relative frequencies in undisturbed Mediterranean forest/maquis environments, pointing to its cultivation as an ornamental tree, especially in the case of Jericho which is surrounded by a desert environment. Archaeobotanical remains from Roman sites in Italy confirm the use of cypress (Ruggiero 1879; Mariotti-Lippi 2000; Landgren 2004: 69; Moser *et al.* 2013) and junipers (Ciarallo and Mariotti-Lippi 1993: 110–11; Landgren 2004: 69; Farrar 2016: 179–80) as ornamental trees. In ancient paintings of the western Roman world, both cypress and junipers are depicted (e.g. Caneva and Bohuny 2003; Farrar 2016: 179–80). While cypress is mentioned as garden plants by Roman writers (Landgren 2004: 68), in the case of juniper it is more difficult to gather textual evidence. This is due to the fact that the same word was used for cedar and juniper in both Greek (*kedros*) and Latin (*cedrus*) because they have similar qualities (e.g. Meiggs 1982: 410). Yet, the use of such plant species by Herod in his ornamental gardens underscores the arguments about

Herod's expression of Roman fidelity, as well as his use of the manipulation of landscape to express power.

#### 4.3.3. Olive (*Olea europaea*)

Olive occurs today in the Mediterranean territory of the southern Levant mostly as a cultivated orchard tree and as a minor natural element (Zohary 1973). Before its widespread cultivation, about 6500 years ago, the wild olive was always only a minor component of the native Mediterranean maquis/forest (e.g. Langgut *et al.* 2019 and references therein). In addition to its economic importance since antiquity, olive has also become the symbol of peace, wisdom, glory, fertility, power and purity. Few charcoal remains of *Olea europaea* were identified in the garden soil of B64; however they were interpreted as the remains of the fertiliser which was used to enrich the soil (Gleason 1993; Miller and Gleason 1994: 27–31). As with the case of Cupressaceae and pine pollen, olive pollen was also retrieved from the palatial courtyard of Herod's Promontory Palace in Caesarea Maritima (Langgut, Gleason and Burrell 2015) as well as from Herod's royal gardens in Herodium (Langgut *et al.* forthcoming). At the latter Herodian site, high ratios of olive charcoal remains were also extracted from the garden-soil of the courtyard of the fortress/palace (Langgut *et al.* forthcoming). The use of olive as an ornamental tree in elite western Roman gardens is also evidenced by archaeobotanical remains and by its appearance in artefacts (Jashemski 1979–1993; Landgren 2004: 69; Farrar 2016: 180). Nowadays it is popular as a tree for bonsai.

#### 4.3.4. Cedar (*Cedrus*)

This was most probably the cedar of Lebanon, which is palynologically indistinguishable at the species level. This majestic conifer was never a native forest-tree in Israel. Scattered cedars are still found in the mountains of Lebanon, probably relics of a formerly more extensive distribution. Other remnants are found in the mountain ranges of southern Turkey and in northwestern Syria (Beals 1965). From early times, the cedar of Lebanon symbolised strength, dignity and splendor, and was considered the prince of trees (Zohary 1982). Suggestions of its use as a prestigious ornamental tree in ancient Israel based on archaeobotanical evidence, derive from Iron Age Megiddo (Benzaquen, Finkelstein and Langgut 2019), from the Persian royal garden at Ramat Rahel, near Jerusalem (Langgut *et al.* 2013) and from the Byzantine garden of the northern church in Shivta (Langgut *et al.* in press). In the western Roman world cedars were also in use as ornamental trees as revealed by their distinctive silhouettes rising above villas in frescos of maritime scenes. Today this majestic tree is planted in gardens and parks in the mountains of northern Israel and in Jerusalem for ornamentation because of its

beauty, robustness, nobility and longevity. As in the case with olive, it is also popular as a tree for bonsai.

#### 4.3.5. *Oriental Plane (Platanus orientalis)*

The oriental plane can be found in the wild in northern Israel and is especially conspicuous in the riverine forest. In this habitat aged specimens can reach 20 m tall and 3 or more metres in circumference (Zohary 1982: 129). As a very large and wide tree with broad, thick leaves that tend to orient horizontally, it is prized for the shade and coolness it provides during the hot season, and it is therefore grown in private and public gardens. Pliny the Elder describes the oriental plane as a luxurious tree which produces no fruit, but only shade, noting that it was imported to Italy from the eastern Mediterranean (*Natural History* 12.3:6). Other ancient authors also mention the plane as a tree that provides much greenery and shade (Jashemski, Meyer and Ricciardi 2002: 146). This long-lived tree with its spreading crown was in demand during the Roman period for the elite gardens of private villas where men strolled for leisure in learned discourse (Macaulay-Lewis 2008), recalling the shady walks of the Athenian Academies of Aristotle, Plato and Theophrastus. The plane was a purely ornamental garden tree offering no commercial products but its shade and thus, to Romans, it symbolised the excesses of royal luxury (Landgren 2013). Evidence of *Platanus orientalis* has been found archaeologically in Roman garden contexts in Italy (Jashemski, Meyer and Ricciardi 2002: 145–46; Moser *et al.* 2013; Farrar 2016: 181), as well as being represented in wall paintings and artefacts (Jashemski, Meyer and Ricciardi 2002: 145–46). Of particular note is the oriental plane depicted as a pruned dwarf tree in a painting in the House of the Golden Bracelet (Gleason 2019: fig. 2). This work of art can be none other than the *chamaeplatanus* (dwarfed oriental plane), described by Pliny the Elder (*Natural History* 12.6:13; Landgren 2013; Farrar 2016: 168).

#### 4.3.6. *Date Palm (Phoenix dactylifera)*

Date palms rank among the earliest fruit trees that were brought into domestication in the Old World some 6500 years ago (Zohary and Spiegel-Roy 1975). The native date palm tree grows in the oases of Mesopotamia and the Near East in habitats characterised by high temperatures, rainless summers, and very low humidity, which is important for fruit setting and ripening (Zohary, Hopf and Weiss 2012: 131). The primary use of date palms is their nutritious fruits which are eaten fresh, dried or processed in a wide-range of methods (Zohary, Hopf and Weiss 2012: 131–34). According to the ancient sources, the area around the Dead Sea was famed in antiquity for the dates grown in the orchards there (Theophrastus, *Historia Plantarum* part II.6; Flavius Josephus, *Jewish War* 4.468). Carbonised remains of date pits are found in the palace complex in Jericho in a variety of contexts,

from fertiliser to hydraulic mortars. The occurrence of date palm pollen at the B64 courtyard suggests its use also for ornamentation. Recent archaeobotanical remains of both pollen and wood at Herod's royal gardens in Herodium corroborates the use of palms as ornamental trees (Langgut *et al.* forthcoming). Similarly, phytolith remains of palm in a large garden complex at Petra suggest ornamental use (Ramsay and Bedal 2015).

Date palm trees were popular garden plants in the Western Roman Empire (Jashemski, Meyer and Ricciardi 2002: 140–41 and references therein). They were used only for ornamental or symbolic purposes since palms cannot bear fruit in temperatures and humidity typical of this part of the world. Indeed, the barrenness of the palm trees growing in the area of Italy was described by Pliny the Elder (*Natural History* 13.6:27) as was the popularity of importing many varieties of the fruit (*Natural History* 13.6:27). Augustus enjoyed a Judean date named for Nicholas of Damascus, a member of Herod's court, who brought them as a gift to the emperor (Pliny, *Natural History* 13.9:42–46). Flavius Josephus records that Mark Anthony gave Cleopatra the date district of Jericho as a gift (*Jewish War* 4.362). Josephus also cites Jericho and its dates in connection with Salome, wife of Herod, and with Julia, daughter of Augustus, citations that indicate fame and popularity of Jericho's dates (*Jewish War* 2.10; Goor 1967). Pliny the Elder discusses the Judaean palm (*Natural History* 13.6:16), specifically the dates coming from Jericho, as be the most well-known (*Natural History* 13.9:44).

The date palms represented in Roman garden paintings differ from the classic image of the date palm tree, with their tall trunks, arching crown and drooping clusters of dates, in that the gardener has removed not only the dead fronds but also the characteristic arching fronds as well, leaving only the young vertical fronds (Gleason 2019: 319, fig. 9). In some of the paintings, the date palm is shown growing in a planting pot or a *dolium* (Jashemski, Meyer and Ricciardi 2002: 140). A date palm planted in a cup/pot is also engraved on a seal found in Masada (Hershkovitz and Amorai-Stark 2007). These artefacts suggest the cultivation of this tree as a dwarf tree, named *Chamaezēlos* by ancient texts of the Roman period (*Natural History* 13.7: 28). At present, date palms are still widely planted in private and public gardens for ornamental purposes, yet, they are not over-pruned as suggested by the Roman paintings. In addition to its economic importance and its use as an ornamental tree, *Phoenix dactylifera* also sustains symbolic value, both in the Judaean culture and in the Roman world, where it was used in triumphal processions to symbolise victory and pacification (Fine 1989; Jashemski, Meyer and Ricciardi 2002). The date palm was so closely associated with the Jews that Hadrianic coins represent Jewish captives beneath a fruiting palm, evidence both of the pacification of the people and control of this valuable and popular economic crop.

#### 4.3.7. Laurel (*Laurus nobilis*)

The laurel is an aromatic small evergreen tree (or a large multi-stemmed shrub) that grows wild in the Mediterranean maquis/forests of northern Israel (Zohary 1982: 120). It is commonly used today as an ornamental plant in gardens across the Mediterranean basin, which is not surprising since it is indigenous to large parts of the Mediterranean region. In the Roman culture, the plant was considered sacred. The Romans adorned their heroes, emperors, and young scholars with crowns made from laurel wreaths (Zohary 1982: 120; Jashemski, Meyer and Ricciardi 2002: 120), as is also depicted in a wall painting in Herodium (Netzer *et al.* 2012). Moreover, laurel is engraved on the white sarcophagi found at Herod's mausoleum at Herodium (Netzer *et al.* 2012). Laurel is mentioned in graffiti found at Herodium in the context of victory (Testa 1972: 22–25). In addition to its association as a symbol of victory, the laurel was also associated with immortality and was used for medicinal purposes and cooking (Jashemski, Meyer and Ricciardi 2002: 120). The laurel was particularly linked with the emperor Augustus. The Roman historian Suetonius (*The Twelve Caesars, Galba* 1) relates the story of Augustus' wife, Livia, who planted laurel on the grounds of her villa at Prima Porta after an eagle dropped a hen with the sprig of laurel clutched in its beak onto her lap. The laurel would become a potent symbol of the Julio-Claudians in Roman art (Flory 1989), and this is seen in the reference to laurels in the gardens of Prima Porta, as discussed above. Several ancient Roman authors specify the preferable horticultural practices for laurel to thrive (Landgren 2004: 68). Indeed, *Laurus nobilis* is prominently identified in Roman paintings as an ornamental plant (Jashemski, Meyer and Ricciardi 2002: 120; Caneva and Bohuny 2003). Laurel is characterised by a robust appearance, both in its natural habitat and in most horticultural uses today. However, in the Roman garden paintings, these species are often depicted as single branches, not as shrubs. This is an effect that could be achieved in a real garden by coppicing, or keeping all growth cut back to the ground so that only a single bough is allowed to develop (Gleason 2019: 319, fig. 9).

#### 4.3.8. True Myrtle (*Myrtus communis*)

Myrtle is an evergreen shrub that can attain a small tree size and grows naturally in Israel, mainly in the more humid northern region (Zohary 1973). Since myrtle is insect-pollinated and therefore its pollen has low dispersal efficiency, it is clear that myrtle was grown in one or more of the planting pots of the B64 peristyle courtyard. With its deep evergreen colour, fragrant white flowers and amenity to clipping to form a hedge, the myrtle has been popular in ornamented gardens in the region since ancient times. It was recently suggested that the presence of charcoal remains of myrtle in Iron Age I Megiddo was related to domestic gardening endeavors (Benzaquen, Finkelstein and Langgut 2019). Myrtle pollen

has also been recovered from a Middle Bronze funerary garden (Kisilevitz *et al.* 2017) and from a royal Persian garden (Langgut *et al.* 2013), both located near Jerusalem, as well as from the Byzantine garden of the northern church in Shivta (Langgut *et al.* in press). In the western Roman world, myrtle was considered to be a significant ornamental plant as indicated by abundant archaeobotanical remains (e.g. Ciarallo and Mariotti-Lippi 1993; Dimpleby and Gröger 2002; Ermolli and Messenger 2013), and its appearance in garden paintings (Jashemski, Meyer and Ricciardi 2002: 129; Caneva and Bohuny 2003; Ermolli and Messenger 2013). Myrtle is explicitly mentioned as a garden plant by Roman writers, as it was the plant of Venus, patroness of gardens (Jashemski, Meyer and Ricciardi 2002: 129–30; Landgren 2004: 46, 68, 183).

#### 4.4. The Significance of Herod's Garden in the Context of the Broader Roman World

The well-planned and -managed ornamental Roman gardens with their skillfully pruned plants as discussed here are in dialogue with the wider cultivated estates of the Roman elite (Marzano 2007; Gleason 2019). Although our old interpretation of Herod's garden at Jericho, as a miniature display of the surrounding *paradeisoi* is now untenable, the new interpretation underlines Herod's well-known skill in testing the limits of the surrounding environment to create places that astonish and defy all norms of Roman landscape architecture. The stunning locations of Herod's gardens, some of them within some of the most extreme landscapes of ancient Judaea, add a special dimension to the story of elite Roman gardens. From the surf of Caesarea, to the arid precipices of Masada, through the artificial semi-arid mountain of Herodium, to the oasis of Jericho, Herod's building projects featured gardens designed to delight viewers with the sheer audacity of their existence, as well as the latest trends from Rome or Alexandria (Gleason 2014).

The new restoration we propose (**Figure 10**), based on the palynology, integrates the new plant list with advances in the study of linear garden layouts from both archaeological remains (Stabiae and the Palatine in Rome) and paintings, as discussed above. Although the exact position of the plants must still remain speculative, we can narrow down the possibilities based on these analyses. The seven rows of pots running north–south allow a central row of pots to form the central axis with the hemicycle (**Figure 11**). Here we have positioned the masterpiece, the *chamaeplatanus* (dwarf oriental plane) whose light leaves and exfoliating bark would have contrasted with the dark foliage of the evergreen plants in the background. The plane tree, as the focal point, is framed by a composition of shrubs, as well as the trunks of the taller palms. While the palms might also have been pruned low, as seen in wall paintings, their position in pits suggests a normal height above the roofline, marking the location this garden from the artificial hill



Fig. 10. Suggested reconstruction of the Ionic peristyle courtyard B64. Drawn by K. Gleason and Y. Korman.

on the other side of Wadi Qelt. In addition, their position to either side of the hemicycle framed the entry to this important room. The normal size of the palms might have emphasised to the viewer the remarkable feat of miniaturizing trees that are normally as large, or much larger, than the date palms. As the viewer strolled around the peristyle, the low plants in the foreground and middleground would be seen as layered against the increasing taller plants of the interior rows. Exceptional specimens would have punctuated the rows, skillfully arranged by colour, form, and seasonal interest, as well as by special shapes or other pruned effects. This layering would provide the effect of the *nemus* or grove, but a grove of very distinctively shaped or ‘barbered’ specimens (*nemora tonsilia*), as depicted in the Roman garden paintings of this time.

Located far from the western Roman world, the garden at the B64 courtyard is no less impressive than any other elite peristyle garden of the period. Surrounded by the very arid landscape, viewed from the mount nearby, this verdant garden (*viridia*) with its evergreen trees expressed the special efforts, and the water wealth required to establish and maintain this display in such a harsh environment (**Figures 10–11**).

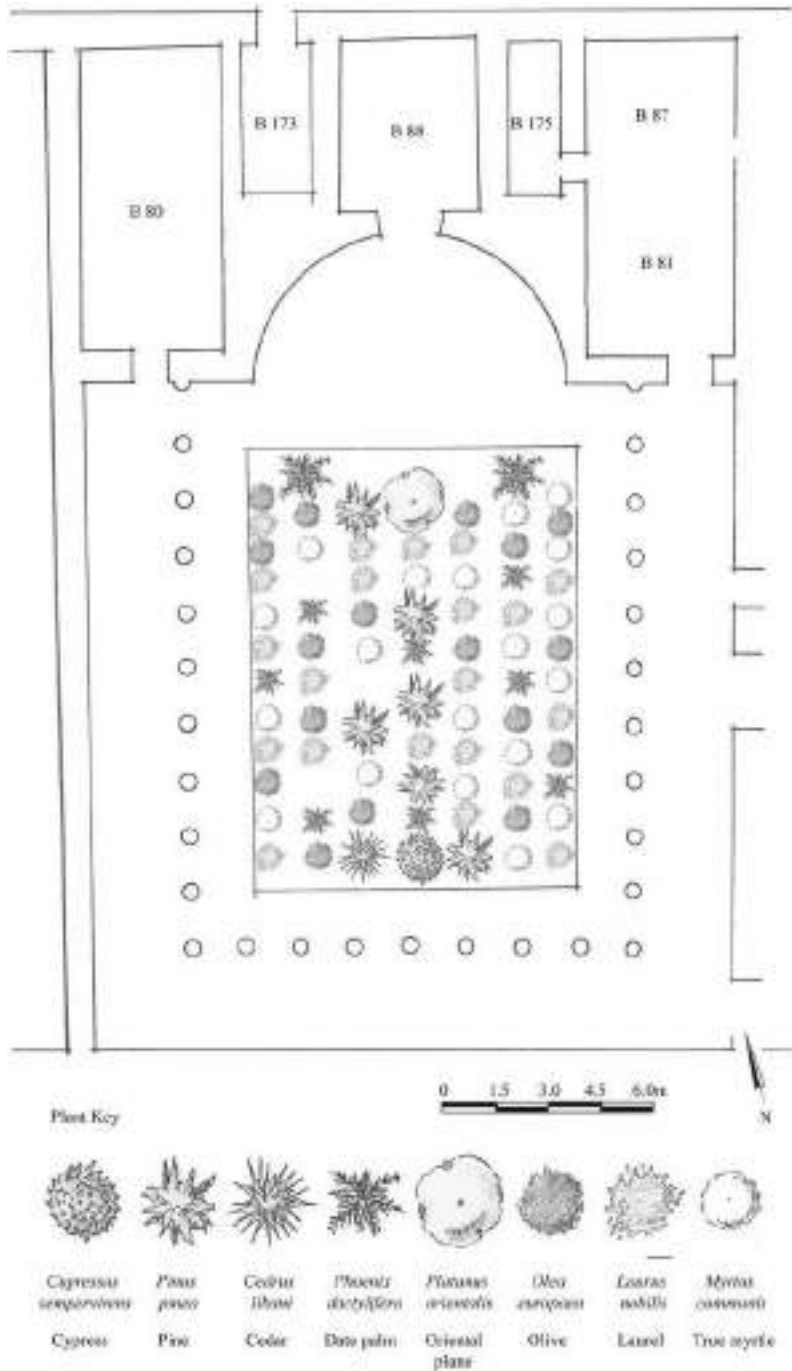


Fig. 11. Planting plan of courtyard B64. Drawn by K. Gleason and Y. Korman.

Allocation of trained gardeners (*topiarii*) was essential, especially when assuming that the trees were miniaturised through pruning. There are ample archaeological and textual indications which show that Herod was inspired by architectural and artistic fashions of the aristocracy of the western Roman Mediterranean (Netzer and Laureys-Chachy 2004; Gleason and Bar-Nathan, 2013), including the arboricultural and horticultural trends attested in the textual sources, such as the *nemora tonsilia* introduced by Gaius Matius. Netzer proposed that Herod was sent teams of building staff from Rome to Judaea by Agrippa, mostly artists who did the wall paintings and masons who introduced the distinctive Roman stonework, *opus reticulatum* at Jericho and Caesarea (Gleason and Palmer 2018), but therefore possibly *topiarii*, as well, given the results of this study. Yet, we must keep in mind that Herod was often in direct dialogue with Augustus and his son-in-law Agrippa during travels and state visits. As the most powerful ruler of the Mediterranean, Augustus set the trends of the time (Berlin 2014), but this does not mean the practices originated only in Italy. He drew inspiration from his travels — and those of his predecessors — around the Mediterranean. Herod's gardens are thus among the earliest examples of gardens at the moment of transition from the late Hellenistic to the early imperial Roman period anywhere, as well as in the East. Discussion continues whether various gardening practices began in Italy, Alexandria, Pergamon, or other notable centres of garden art. Debates on the origins and flow of ideas will continue until more gardens are well excavated.

## 5. CONCLUSIONS AND SUMMARY

Built at the zenith of Herod's reign, the Third Winter Palace of Herod in Jericho is considered to be the most elaborate palace among the three that form this extensive complex along the Wadi Qelt. The identification of pollen of trees and shrubs that grew in the planting pots of the unique Ionic peristyle garden (Area B64) indicates that it was a garden characterised by dwarf trees, grown in pots but scaled to the height of the visitor, rather than the tinier, more dramatic dwarfism of Japanese bonsai. Dwarfing trees and shrubs through pruning (*nemora tonsilia*) was a fashionable horticultural practice in the western Roman world, as evidenced by wall paintings and contemporaneous literature. The establishment and maintenance of such a garden required employing *topiarii* — specialised gardeners. These well-trained specialists not only designed and managed the plants, but ensured that the preferred soil would be used for cultivation and took care of the drainage and irrigation systems needed to create the environmental conditions required for the trees and shrubs to thrive in a desert.

The location of the garden in a desert landscape contributed to the success of the research in several ways: the B64 courtyard garden is among the best preserved archaeologically outside of the Vesuvian region, mainly due to the dry conditions

which characterised the area for millennia. Once the Hellenistic and Roman water channels were defunct, cultivation did not take place again until recent times. The arid conditions are also responsible for the good state of preservation of the pollen grains. Additionally, unlike many western Roman gardens where the palynological spectra are often vague due to the strong background noise of windborne pollen from the nearby surroundings, Jericho is located relatively far from the Mediterranean environment. The Mediterranean arboreal pollen identified in this study is therefore more likely to originate from the garden, pointing to the high investment of sustaining plants outside their natural habitat.

Our palynological analysis in the B64 courtyard revealed the presence of a garden with peculiar characteristics with respect to the other gardens of the Roman world. Thus, while Herod is well known for his great architectural contributions, he should be equally credited for his abilities in innovative landscape and garden design. No doubt this garden left a lasting impression on the high-ranking visitors to this elegant artificial oasis in the desert of Jericho. Its dwarfed trees and shrubs, which created a sense of lushness and verdancy, together with the outstanding architectural and artistic features of this Ionic courtyard, symbolised Herod's secure hegemony and affluence both at home and within the Roman world.

## ACKNOWLEDGMENTS

This study was supported by the Israel Science Foundation (Grant no. 997/15) awarded to D. Langgut. We wish to thank V. Epstein for her help with the processing of pollen samples. Y. Korman and M. Cavanagh are acknowledged for their talented assistance in the preparation of the figures. We would like also to express our gratitude to S. Lev-Yadun for his helpful comments on an early draft, as well as to both of the two anonymous reviewers for their useful feedback.

## GLOSSARY OF TERMS

*Ars topiaria*: the art of elite ornamental gardening; the art of creating *topia*, garden evocations of cultural places, often associated with the arts of landscape painting and theatre set design.

*Chamae*: the state of being dwarfed.

*Nemora tonsilia*: the art of pruning trees into miniaturised groves and ornamental arrangements.

*Topiarius*: long thought to be a generic term for an ornamental gardener, the term is now understood to be a designer of the effects created in *ars topiaria* (*topiarii* is the plural form).

*Viridia*: a garden display of collected ornamental plants. The term, used entirely for ornamental collections, is applied to both private gardens and public parks.

*Virid[i]aria*: multiple collections or displays within a single garden or park, both private and public. The term implies a well-watered and verdant environment.

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