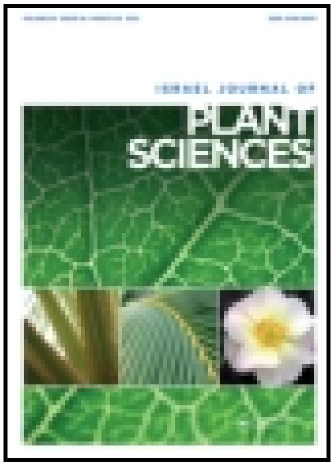

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Pollen analysis as evidence for Herod's Royal Garden at the Promontory Palace, Caesarea

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This study is the first to successfully address the identification of the botanical components of a garden in the 2000-year-old palatial courtyard of Herod the Great's Promontory Palace in Caesarea Maritima. Based on the extraction and identification of fossil pollen grains, we were able to reconstruct at least part of the garden's flora, which, we argue, could only have grown within the confines of a garden of this splendid seaside palace which was protected architecturally from salty sea spray. The palynological spectrum included, among other taxa, high percentages of Cupressaceae pollen (cypress) as well as pollen of the non-local tree *Corylus* sp. (hazelnut), which was most probably introduced as an ornamental from the northeast Mediterranean or from Italy. These trees appear to have been accompanied by other ornamental plants (e.g. *Salvia* and various Rosaceae plants). The choice of flora to be planted in the garden is consistent with our knowledge of prestige Roman gardens dated to Herod's time. This exceptional and magnificent palace, with its luxurious architectural features and its impressive, well-maintained garden, symbolized the power and the abilities of King Herod, the greatest builder in ancient Jewish history.

Keywords: pollen; Herod the Great; Caesarea Maritima; Promontory Palace; early Roman period; ancient garden; Cupressaceae; *Corylus*

Introduction

The vegetal composition of ancient prestige gardens of the ruling class in the Levant was a mystery until recently, when a breakthrough was achieved by extracting fossil pollen grains from ancient plaster originating in various plastered installations in such gardens. The use of this unique method enabled the reconstruction of the botanical components that grew in an ancient royal Persian garden at Ramat Rahel near Jerusalem, dated to the fifth to fourth centuries BCE (Lipschits et al. 2012; Langgut et al. 2013). As pollen grains are the "fingerprints" of many plant taxa, they are extremely helpful in the reconstruction of ancient natural vegetation as well as environments shaped by man (Bryant & Holloway 1983; Bryant 1989; Faegri & Iversen 1989). Pollen cell walls are made of sporopollenin, the most durable organic substance in nature, and therefore can be preserved as fossils for hundreds of thousands of years, mainly in anaerobic environments (e.g. Bryant 1989; Faegri & Iversen 1989), but also in archaeological contexts such as mud-bricks (e.g. Drori & Horowitz 1989) and plaster (e.g. Weinstein-Evron & Chaim 1999; Schoenwetter & Geyer 2000).

As is well known from historical and archaeological records, artificially planted gardens were part of many palatial edifices. Usually, they demonstrated the palace owner's capabilities both in controlling the natural environment and in importing and possessing rare and exotic plants, as well as his abilities to sustain these plants in their unnatural habitat (Foster 2004; Conan 2007; Gleason 2014). During the Roman period, the phenomena of prestige gardens and ornamental horticulture became highly developed (Jashemski 1979–1993; Landgren 2013).

This study aims to identify the botanical components of a royal garden of King Herod the Great of Judea (ca. 74/73–4 BCE) in his palace in Caesarea, which was excavated under the name Promontory Palace by the team of Netzer, Gleason, and Burrell (Levine & Netzer 1986; Gleason et al. 1998). The name was also adopted by Porath, who excavated part of the complex on behalf of the Israel Antiquity Authorities (IAA) (Porath 1996). Herod the Great was known as the greatest builder in ancient Jewish history and was responsible for several colossal building programs throughout his kingdom. Archaeological excavations have revealed the existence of gardens

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This paper has been contributed in honor of Professor Daniel Zohary

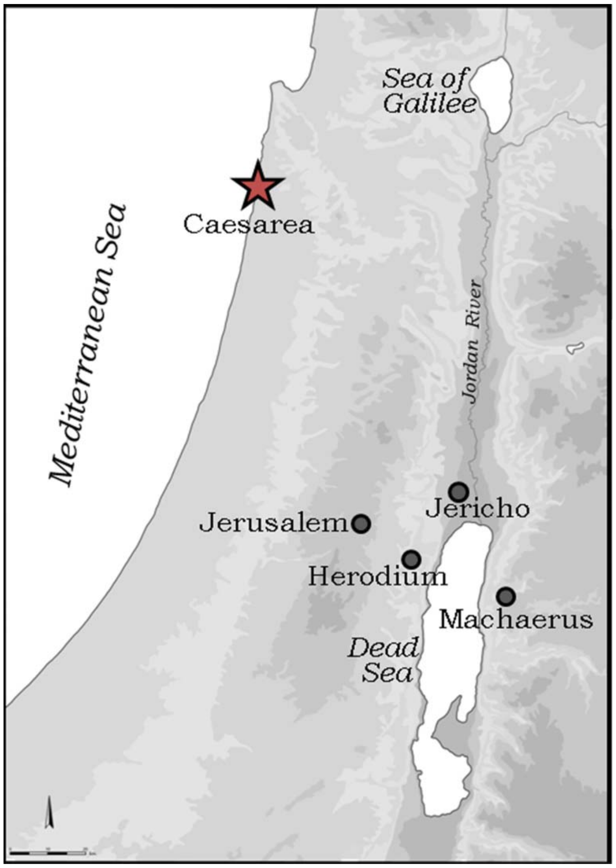

Figure 1. Map locating Caesarea and other Herodian sites where royal gardens were discovered.

within and around Herod's palaces and monumental buildings in Caesarea, Jericho, Machaerus, and Herodium (Figure 1; Netzer 1981, 2001, 2008; Gleason 1993, 2014; Gleason et al. 1998; Evyasaf 2010; Netzer et al. 2010; Gleason & Bar-Nathan 2013). Several archaeobotanical studies have been performed at Herodian sites (Liphschitz & Lev-Yadun 1989; Weinstein-Evron et al. 1989; Giorgi 1999; Liphschitz 2007; Lev-Yadun et al. 2010; Ramsay 2010), yet none of these were directly linked to the gardens, or aimed to reconstruct the composition of the gardens' vegetation. Gleason submitted carbonized macrobotanical samples from garden soils in Herod's palaces at Masada, Jericho, Caesarea, and Herodium for analysis, but the remains analyzed appeared to comprise components of the fertilizers used there rather than of the garden's plants, as is often the case in garden soils (Gleason 1987; Miller & Gleason 1994).

This study aims to reconstruct the botanical components of the courtyard of Herod's Promontory Palace at Caesarea based on fossil pollen investigation. This new information provides the first tangible evidence for a garden in the early phases of the upper courtyard (Figure 2). It may also shed light on several aspects of Herod's world, including the use of plants to signify an elite status, and importation of plants for the purpose of prestige.

The Promontory Palace at Caesarea

In 22 BCE, Herod began to build an enormous artificial harbor (Sebastos), a palace (Herod's Promontory Palace)

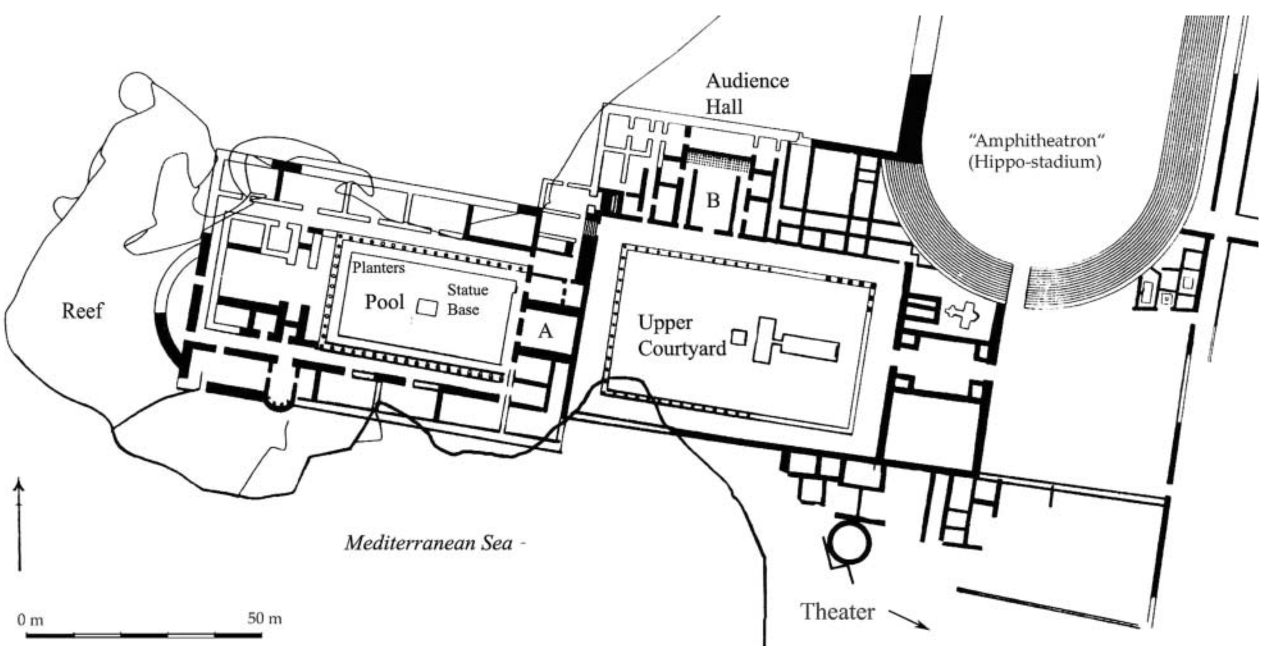

Figure 2. Plan of the Promontory Palace complex.
Drawn by J. Howard Williams, courtesy of the Promontory Palace Excavations.

Figure 3. Aerial view of the Promontory Palace during reconstruction of the site, 1995.
Photograph by OFEK, courtesy of Promontory Palace Excavations.

and a city (Caesarea Maritima) on the Mediterranean coast of his realm (Figure 1). Herod devoted a major portion of his personal and his kingdom's wealth and resources to the project (Burrell 1996, 2009; Netzer 1996). Flavius Josephus (*Jewish Antiquities* 15.331) called it the "most magnificent palace". It was constructed on a promontory in two stages (Figures 2 and 3; Gleason et al. 1998): the first phase ("Lower Palace") was built around a large rock-cut decorative pool, probably between 22 and 15 BCE (Levine & Netzer 1986). Netzer interpreted a series of small rectangular cuttings around the pool as evidence for planters between the columns (Levine & Netzer 1986), providing a garden effect. The second phase – the "Upper Palace" – was built for the inaugural festivities of the city in 10 BCE (Gleason et al. 1998). The latter integrated the Palace into the structure of the city, and was associated with the adjacent theater and stadium/hippodrome. The Upper Palace included a courtyard (42 × 65 m) surrounded by a colonnade with plaster-coated columns (Figure 4; Gleason et al. 1998). Although the open courtyard was partially surfaced with crushed local kurkar (a calcareous sandstone common in Israel; Patrich 2011), it was also probably planted in some areas, to provide shade, color, scent and greenery, as well as prestige. Indeed, garden soils were identified at the east end of the courtyard dated to the Roman period. Smaller patches of cultivatable soil at the west end are associated with the earlier phases of the palace, but are so disrupted by later uses and activities that it has been difficult to assert the presence of a garden. The palace continued to be in use throughout the Byzantine era, and a new structure was built into the northern colonnade on the east side of the courtyard, interpreted as a double-apsed garden pavilion paved with marble (Porath 1996; Patrich 2011).

For the wider Greco-Roman world, Caesarea served as a showcase for King Herod's realm. The design of the harbor, the city, and the palace was the ultimate accomplishment of this cosmopolitan king (Burrell 2009). Within the palace, the craftsmanship of the stonework, the mosaics, and the frescoes is excellent (Gleason et al. 1998). However, no data are yet available on the plants that were used for ornamentation, or, until now, even evidence for the upper courtyard as a setting for planting displays. Was the choice of plants inspired by Roman, Hellenistic, or local garden traditions? Were the royal garden plants introduced from far-off countries for propaganda purposes? The results of analyses of several pollen samples presented in this paper shed new light on those questions.

Figure 4. Colonnade bases around the courtyard, Upper Palace, Promontory Palace at Caesarea.
The columns were made of local sandstone (kurkar) and had a fine plaster coat. Plaster samples for palynological investigation were taken from the bases of these columns. The pollen results show that only one column base included well-preserved pollen grains (marked with red star; field ID − Caesarea 2013 PP G71/2013#1 and #2). The most surprising findings within these pollen assemblages were the high percentages of Cupressaceae (cypress) and the occurrence of pollen of the non-local tree *Corylus* sp. (hazelnut).

Material and methods

Field sampling strategy

The sampling strategy followed the following assumptions and evidence: the kurkar architecture of the Promontory Palace was covered by plaster (e.g. Gleason 1993; Netzer 2011; Patrich 2011); pollen can be well preserved in plaster (e.g. Horowitz 1992; Weinstein-Evron & Chaim 1999); if one (or more) of the plaster layers facing the garden had been prepared or renewed when the garden was in bloom, then pollen grains could be caught from the air by the wet surface of the plaster (Langgut et al. 2013); and if water from different facilities of the garden (e.g. water channels, pools, tunnels) was used to mix the plaster itself, pollen would also have been mixed into the plaster layers below the surface (Langgut et al. 2013).

During a field season in 2013, 2−3 cm pieces of plaster were pried off with sterile equipment from four surfaces within the area of the palace (Table 1). A red dot was marked on the surface of each of the samples, which were then sealed in bags and labeled.

Archaeological context

Samples were taken only from secure archaeological contexts in terms of stratigraphy and dating (Bryant & Holloway 1983; Weinstein-Evron 1994); every precaution was taken to prevent contamination. At the site, the architectural features from which the plaster was taken were dated by their type of construction as well as the surrounding stratigraphy. Our analyses suggest that some of these features were exposed for hundreds of years, so the survival and maintenance of the original plasters and mortars that have provided the samples in this study will require additional investigation. However, previous studies on mortars have established a classification of distinct technological stages, from single-layered pure lime Roman plaster used during the reign of Herod the Great to a

Table 1. Samples taken for preliminary palynological investigation, Promontory Palace, Caesarea.

	Field ID and location	Location description	Lab no.	Plaster subdivision	Results
1	Caesarea 2013 PP G71/2013 plaster (T); courtyard	Column base of the northeast colonnade, slightly east of the audience hall. Dated to Herod's time	Caesarea 2013 #1	Top (surface)	Pollen was well preserved
2	Caesarea 2013 PP G71/2013 plaster (B); courtyard		Caesarea 2013 #2	Bottom (back portion)	Pollen was well preserved
3	Caesarea 2013 PP G71/2013 plaster (T); courtyard	Column base of the northwest colonnade of the upper promontory, slightly east of the audience hall, but west of Samples 1 and 2. Dated to Herod's time	Caesarea 2013 #3	Top (surface)	Pollen-barren
4	Caesarea 2013 PP G71/2013 plaster (B); courtyard		Caesarea 2013 #4	Bottom (back portion)	Pollen-barren
5	Caesarea 2013 PP G71/2013 northwest-facing to Byzantine garden (T); garden near the pool?	West-facing side of apsidal basin in the lower promontory. This basin is within the large triclinium. Dated to the Roman period	Caesarea 2013 #5	Top (surface)	Pollen-barren
6	Caesarea 2013 PP G71/2013 northwest-facing to Byzantine garden (B); garden near the pool?		Caesarea 2013 #6	Bottom (back portion)	Pollen-barren
7	Caesarea 2013 PP G71/2013 (T); lower palace	Facing the lower promontory palace to its south	Caesarea 2013 #7	Top (surface)	Pollen-barren
8	Caesarea 2013 PP G71/2013 (B); lower palace		Caesarea 2013 #8	Bottom (back portion)	Pollen-barren

triple-layered grog, lime, and charcoal plaster in the fourth to fifth centuries CE (e.g. Porath 1984).

Four samples for preliminary palynological investigation were taken from the Upper Palace courtyard's column bases, which were made of local sandstone (kurkar) coated with plaster (Figure 4). Another two samples were collected from a plaster-coated basin in the apse of the main triclinium in the Lower Palace; although it was not an exterior feature, it was open to the garden that was constructed around the pool, and may have captured some pollen from breezes passing the garden and entering the triclinium. Two additional samples were taken from the plaster on the south side of the Lower Palace (Table 1).

Laboratory procedure

In order to evaluate whether the pollen grains were trapped within the plaster's wet surface while it was drying, or whether the grains had penetrated in a different way, we followed the technique that was developed by Langgut et al. (2013). This new method includes plaster subsampling prior to pollen extraction. Each plaster sample (usually less than 10 mm wide) was divided into two subsamples: the outer part (< 0.5 mm), which was peeled away using a sharp razor blade, and the second subsample, which included only the inner filling material. Prior to this subdivision, the samples' surface was cleaned with compressed air to prevent contamination by recent pollen.

The physical−chemical pollen extraction preparation procedure followed the steps below. One *Lycopodium* spore tablet was added to each sample in order to calculate the pollen concentrations (e.g. Bryant & Holloway 1983; Faegri & Iversen 1989). Next, the samples were treated with 10% HCl to remove the carbonates (up to about 3 h when the reaction ended), and then a density separation was carried out using $ZnBr_2$ solution (with a specific gravity of 1.95) together with sieving (150 μm mesh screen). Then, samples were subjected to an acetolysis process in order to dissolve cellulose, chitin, and other organic materials, thereby concentrating the pollen. Later, unstained residues were homogenized and mounted onto microscopic slides using glycerine.

Pollen identification

A light microscope with magnifications of 200×, 400×, and 1000× (immersion oil) was used for identifying the pollen grains. In each sample, all the extracted pollen grains were counted and identified. For pollen identification, a comparative reference collection of the Israeli pollen flora of Tel Aviv University (deposited in the Steinhardt Natural History Museum) was used, in addition to regional pollen atlases (e.g. Reille 1995, 1998, 1999; Beug 2004).

Palynological spectrum and pollen origin

Two of the plaster samples taken for investigation yielded well-preserved pollen grains, while the other six samples were pollen-barren. The two fertile samples (samples nos. 1 and 2, Table 1) were collected from the column base of the northeastern colonnade positioned slightly east of the Audience Hall (Gleason et al. 1998). This base was found lying on its side near its original location, so the original orientation of the base is not known (Figure 4). Based on its construction from kurkar stone and the type of plaster, it is dated to the time of Herod the Great. The piece of plaster taken from the column base was divided into two: the surface of the plaster and its back portion (sample no. 1 and sample no. 2, respectively).

According to the pollen identification results presented in Table 2, both pollen samples included wind-pollinated Mediterranean elements common to the native Mediterranean forest/maquis, such as: evergreen oak (*Quercus calliprinos* pollen type – up to 8.7%), *Pinus halepensis* (not exceeding 36.8%) and *Olea europaeae* and *Pistacia* spp. (up to 4.8% and 3.8%, respectively). It is not clear whether these wind-pollinated taxa, which are characterized by generally high pollen dispersal efficiency (e.g. Faegri & Iversen 1989), originated from the nearby natural vegetation, or were being grown in the courtyard. The *Olea* pollen could have been derived from the Upper Palace courtyard or from olive plantations on the coastal plain and/or from the western slopes of Mount Carmel

Table 2. Preliminary pollen results, Promontory Palace, Caesarea, 2013.

	Sample ID and its context			
	Caesarea 2013 # 1; surface plaster (T), base of the northeast colonnade; courtyard, upper promontory		Caesarea 2013 # 2; back plaster portion (B), base of the northeast colonnade; courtyard, upper promontory	
Taxon	Absolute numbers	%	Absolute numbers	%
Quercus calliprinos type	9	8.7	6	5.1
Quercus ithaburensis type	7	6.7	0	0.0
Pinus sp.	13	12.5	43	36.8
Pistacia sp.	4	3.8	0	0.0
Olea europaea	5	4.8	4	3.4
Phillyrea sp.	2	1.9	0	0.0
Corylus sp.	3	2.9	2	1.7
Cupressaceae	29	27.9	11	9.4
Poaceae	1	1.0	0	0.0
Cereal type	0	0.0	6	5.1
Asteraceae *Asteroideae*	0	0.0	4	3.4
Artemisia sp.	0	0.0	2	1.7
Bunium type	1	1.0	11	9.4
Sium (Apium) type	1	1.0	1	0.9
Atriplex type	7	6.7	8	6.8
Caryophyllaceae	0	0.0	3	2.6
Fabaceae	0	0.0	1	0.9
Ephedra fragilis type	0	0.0	1	0.9
Salvia type	7	6.7	0	0.0
Brassicaceae	6	5.8	12	10.3
Polygonaceae	2	1.9	0	0.0
Rosaceae	3	2.9	2	1.7
Cistus	3	2.9	0	0.0
Campanulaceae	1	1.0	0	0.0
Total counted	106	100.0	117	100.0
Lycopodium clavatum	1642		2088	
Unidentified	0		7	
Weight (gram)	0.12		1.1	
Pollen concentrations (g/sediment)	5961.7		609.0	
Fungus	1		0	
Spores	3		14	

and the Menashe Hills. During the Roman and Byzantine periods, olive cultivation was widespread in the Carmel area, as indicated by a previous pollen study from this area (Weinstein-Evron et al. 1989), as well as other regions (Baruch 1986, 1990; Neumann et al. 2007; van Zeist et al. 2009; Litt et al. 2012). The high percentages of pine pollen most probably do not reflect its real ratios in the spectrum, as *Pinus* has been shown to be highly over-represented in the pollen rain of the region (e.g. Baruch 1993). On the other hand, the high frequencies of Cupressaceae pollen type (cypress family – up to 27.9%) are very surprising, as it appears in much higher percentages than in its relative pollen ratios in the natural Mediterranean forest/maquis. In general, Near Eastern Cupressaceae pollen includes *Cupressus sempervirens* and *Juniperus* sp., which are palynologically indistinguishable (Beug 2004). Its appearance in high percentages may indicate that this taxon was grown in the courtyard. Among the wind-pollinated arboreal pollen, a non-native tree, *Corylus* sp. (up to 2.9%), was identified in both samples.

Some taxa of herbs and small shrubs were also identified, the dominant among them being: Brassicaceae (up to 10.3%), *Salvia* (6.7%), and *Cistus* (2.9%). As these are insect-pollinated plants, their pollen does not tend to spread over great distances (e.g. Faegri & Iversen 1989), so there is a good chance that these herbs and small shrubs grew within the garden itself. The second sample also included wind-pollinated shrubs – *Artemisia* and *Ephedra*, which are typical plants of the stabilized dunes in the area to this day (e.g. Zohary 1962, 1973; Kadosh et al. 2004).

The partial overlap in the pollen taxa may indicate that the subdivision into two layers which was conducted in the laboratory (dividing plaster surface from inner filling material) was not sterile, probably due to the fragmentary character of the material. This means that the two pollen spectra from the surface subsample and inner subsample contained both pollen which was trapped within the wet plaster surface while it was drying, and pollen which penetrated the plaster material, probably via the water which was used to mix the fresh plaster during its preparation. However, the higher pollen percentages of Cupressaceae in spectra from the first subsample indicate that this sample most probably represents a palynological spectrum of the time when the plaster was drying. The plastering process probably took place during the spring, as all the identified plants within the first assemblage are spring bloomers (Table 2). That may also explain the higher pollen concentrations in the surface subsample in comparison to the inner subsample (5961.7 versus 609.0 pollen grains per gram, respectively).

Discussion

Within the fertile pollen spectra, some pollen may have originated from the nearby natural vegetation, while other pollen grains most probably belong to plants which grew within the courtyard, based on the interpretation of their frequencies compared to pollen spectra representing local wild plants as well as on their mode of pollen dispersal. There is no doubt that the two most surprising and significant findings within these pollen assemblages are the high percentages of Cupressaceae pollen type (27.9%), and the occurrence of a non-local shrub/small tree, the hazelnut (*Corylus* – 2.9%; Figure 5).

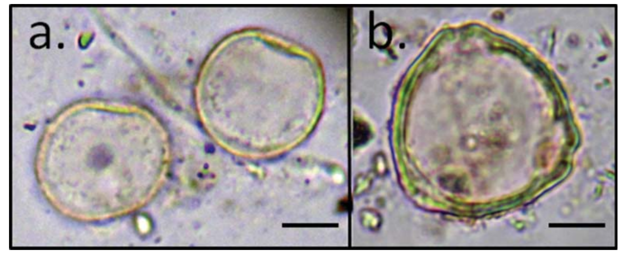

Figure 5. Pollen grains extracted from the base of the northeast column in the palace courtyard in Caesarea.
(a) Two pollen grains of Cupressaceae. (b) *Corylus* sp. pollen. Each bar = 10 μm.

The Cupressaceae family is considered part of the ancient Levantine natural flora. It is encountered in Pleistocene fossil pollen diagrams and in prehistoric sites (e.g. Lev-Yadun 1987; Lev-Yadun & Weinstein-Evron 1993). In Caesarea, however, it appears in much higher percentages than in its relative frequencies in undisturbed Mediterranean forest/maquis environments. The high *Cupressus* pollen percentages are also surprising due to the fact that these plants are typically under-represented in pollen assemblages. Although *Cupressus sempervirens* is an important participant in several plant communities in the Middle East, it usually does not form large forests (Zohary 1973; Lev-Yadun & Weinstein-Evron 1993). At Herodium, over 74% of the wood remains were identified as cypress (Liphschitz 2007), although the dates and contexts of their original use still need to be verified, as the samples were taken from secondary use (R. Porat, personal communication). Dozens of *Cupressus sempervirens* wood remains were also found in Masada (Liphschitz & Lev-Yadun 1989). Still, could such findings indicate that Herod the Great organized his palace courtyards in the same gardening pattern?

According to ancient paintings of Roman villas, it seems that one role that distinctively shaped trees such as cypresses (*Cupressus sempervirens*) or umbrella pines (*Pinus pinea*) played in villa gardens was to attract the attention of passersby, and enhance their reading of the status of the villa. Many of the paintings feature trees in courtyards behind the facades of seaside villas (e.g. the one from Pompeii presented in Figure 6; Jashemski et al. 2002; Landgren 2004, pp. 70–71). Archaeobotanical remains (e.g. Ruggiero 1879; Lippi 2000; Moser et al. 2013), as well as the identification of a cypress root cavity

Figure 6. Painting from Pompeii of a seaside Roman villa with cypress trees.
The painting is on display at the Naples Museum (Landscape with Boats, by unknown artist, 1-37, 1st Century A.D., ripped fresco, 59 × 69 cm / Museo Archeologico Nazionale, Naples, Italy / Mondadori Portfolio/Electa/Luigi Spina / Bridgeman Images).

(Landgren 2004, p. 69), confirm the use of cypress as an ornamental tree in Italy during the Roman period. Several Roman writers mention cypresses as garden plants (Landgren 2004), the most interesting of which is Pliny the Younger's description of a group of cypresses creating a walkway in his Tuscan villa (first century CE) (Bosanquet 1909). According to Lev-Yadun and Weinstein-Evron (1993), *C. sempervirens* was only a secondary component in most areas of distribution in the past. Therefore, the high frequencies of cypress pollen (27.9%) point to this tree species most probably being planted in the courtyard.

Corylus sp. is not a local member of the natural environment of Israel (e.g. Zohary 1973; Horowitz 1979; Weinstein-Evron 1983; Langgut et al. 2011). The current distribution of *Corylus* sp. is mainly in central Europe, and its southern natural distribution limit is at about latitude 36°, in southwest Turkey (Browicz 1982, p. 18). *Corylus* is, however, a common component of ancient Roman gardens, as evidenced by pollen samples taken from several gardens in the Vesuvius area (Lippi 2000; Dimbleby & Grüger 2002), and its portrayal on a wall painting from Herculaneum (Jashemski et al. 2002, p. 103). *Corylus* nut remains were also identified in the harbor of Caesarea by Ramsay (2010), although their context was dated to several centuries later than Herod's time, to the Byzantine period (fourth to sixth centuries CE).

Grown primarily for its nuts, *Corylus* sp. is easily coppiced or pruned for ornamental use. Because this species is intolerant of salt spray, the trees may have been kept pruned back and protected within the confines of the courtyard. Even if cypress trees rose to the heights seen in the ancient villa paintings, they too might have been more tolerant of the salt spray if their soil and much of their height were similarly shielded. Both the hazelnut and the cypress are drought-tolerant, offering the reliable appearance of verdancy even in the urban district farthest from the castellum of the aqueduct. In the palynological study obtained from sediments extracted from the Herodian port of Caesarea, reflecting the nearby natural vegetation during the Roman period (Weinstein-Evron et al. 1989), no pollen of cypresses or *Corylus* was identified. Their findings add weight to the conclusion that these trees actually grew in the courtyard of King Herod's Promontory Palace.

Evidence for other ornamental plants which possibly grew with the cypresses and hazelnut trees in King Herod's palace garden is the pollen of *Salvia*, Rosaceae and Brassicaceae families (Table 2). The *Salvia* pollen type includes several species of sage. The different species are used medicinally, as culinary herbs, and also for their ornamental and aromatic foliage. The various plants within the Rosaceae and Brassicaceae families are difficult to distinguish based on morphological pollen grain criteria. The Brassicaceae family in Israel is very diverse and contains more than 70 genera and 150 species; some *Brassica* sp. plants are used as crops, others as ornamentals, and some are common weeds. Because the different members of this family are indistinguishable palynologically, it is impossible at this stage to shed more light relating to Brassicaceae and the garden. As in the case of *Cupressus*, Rosaceae taxa are under-represented in the palynological spectrum (e.g. Baruch 1993). Roses (family Rosaceae, genus *Rosa*) are widely grown for their beauty and their appealing aroma. Different species hybridize easily, and this has been used in the development of the wide range of garden roses. Rosaceae pollen was recovered from many Roman garden sites in the Vesuvius area (Jashemski et al. 2002, p. 177) and evidence of a *Rosa* root cavity was found in the prestige garden of Villa of San Marco, Stabia (Landgren 2004; p. 69). Rose plants are also depicted in wall paintings from Campania (Pompeii, Herculaneum, the villas, Naples; Jashemski 1979−1993; Landgren 2004) and are referenced as garden plants among Roman writers (Landgren 2004, p. 68). Carbonized remains identified as *Rosa gallica* were found in recent excavations among the water features of Vespasian's Temple of Peace in Rome (Celant 2005).

Conclusions

Our palynological study offers a window onto a palatial garden of King Herod the Great, and makes it come alive. Herod built a splendid palace as a showpiece of his new city, Caesarea, and its great artificial harbor, Sebastos. The palace was built on the only promontory other than those used for the harbor, and could be used to inspect it from the south. This impressive palace complex shows King Herod's ability to design for the particular demands and ambitions of his reign, while creating a structure of exceptional magnificence. It is therefore not surprising that efforts were also devoted to planting and sustaining a splendid garden, even though its location near the sea offered a relatively harsh, saline environment.

Our palynological study revealed that within the courtyard of this impressive palace grew conifer trees belonging to the cypress family (most probably *C. sempervirens*), together with at least one imported tree, the hazelnut. A previous palynological study at the Royal Persian garden at Ramat Rahel near Jerusalem dated to the fifth to fourth centuries BCE also produced evidence of special, highly valued trees, most probably imported from far-off lands by the ruling Persian authorities. The most surprising find at Ramat Rahel, and marking its earliest appearance in the southern Levant, was the citron (*Citrus medica*), which later acquired a symbolic−religious role in Judaism. Other imported trees found to have been grown in the Ramat Rahel garden are the cedar of Lebanon (*Cedrus libani*) and birch (*Betula* sp.). The pollen evidence of these foreign trees in this Persian palatial garden suggests that they were probably brought to flaunt the power of the imperial Persian administration (Langgut et al. 2013).

The palynological investigation conducted with samples from the Herodian harbor (Weinstein-Evron et al. 1989) helped us to distinguish between these and the palynological spectrum of pollen grains originating from the Mount Carmel and Coastal Plain areas (probably oaks, pines, pistachios, olives) from that of the Herodian garden. It is possible that the arboreal vegetation in the garden was accompanied by small ornamental shrubs and bushes (among them *Salvia*, rose plants, and some sort of *Brassica*), as was common in Roman gardens dated to the same period.

The identification of cypress and hazelnut, both typical features of Roman gardens of the early Roman period, may show that King Herod the Great was inspired by planted spaces that he might have seen during his travels to Rome or around Greece and Asia Minor. Considering the close integration of architecture with the landscape at all of King Herod's palaces (Gleason 2014), it is not surprising that efforts were made to import trees, and to "defy nature" by using the building to sustain a garden in a saline windy coastal environment. The desire to present trees from the distant parts of the Roman empire in his gardens was probably a part of King Herod's propaganda and display of his power.

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