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Botanical representations from *Villa della Piscina di Centocelle* (Rome, Italy) for a reconstruction of ancient Roman gardens

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ABSTRACT
Plants remains and phytoiconographic elements are important tools to reconstruct the lost gardens. Archaeobotanical data can give controversial results in areas having great anthropic disturbance, such as in the suburban *Villa della Piscina in Centocelle* (Rome). Then, we analyzed the plant representations to provide information for the reconstruction of the ancient gardens, studying the fragments of the decorated wall and of the ceiling structures remains that are usually neglected in their size, shape and color. After the identification of the plant species, we collected information on their symbolic value and on their role in the garden. Preliminary data showed the presence of about twenty species, mainly from the Mediterranean area. The symbolic groups presented a slight prevalence of solar and salvific elements. For the garden we identified species used to decorate and border the flowerbeds, but also with productive role. The analysis of these represented naturalistic elements gives support in understanding the historical greenery behind their representation.

Section: RESEARCH PAPER

Keywords: Historical garden; botanical iconography; lost garden; cultural landscape; biodiversity; painting plants

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1. INTRODUCTION

The importance of gardens in ancient cultures, and in particular in the Roman one, is well known. The Roman gardens were in close connection with daily life in all perspectives, from the religious one (gardens and sacred groves, temple gardens), to well-being (baths), schools (gymnasia), and places used for activity linked to the political power [1]-[4]. Precisely defining the term "villa" and establishing its origin is not easy, even following its evolution over time [3], [5]. In any case, the villa expressed a particular and characteristic lifestyle of the Roman aristocracy. Villas were divided into two functionally different parts: the owner's residential part (*Pars Urbana*) and the productive farming part (*Pars Rustica* and *Fructuaria*), which was not lacking even in the rich leisure villas [6]-[9].

Regarding the evolution of Roman villas and their gardens, in the pre-Republican era, villas primarily functioned as rural settlements aimed at agricultural productivity. However, even then, there was a focus on ensuring comfort and luxury within the residential spaces.

In the Republican period, they became agricultural companies, and their gardens initially had a relatively simple shape, which contributed to the production of the villa. From the last two centuries BC, the gardens of the villas underwent strong transformations, especially due to contact with Hellenistic cultural, artistic, architectural, and horticultural traditions [6]. The suburban gardens were much less, or almost not at all, utilitarian, and they were equipped with architectural elements that increased their philosophical, and cultural value inspired by the Hellenistic gymnasia [3], [6], [8], [9].

The gardens of Roman suburban villas were very similar to those of the urban villas but with some essential differences: the suburban villas generally had a peristyle placed in front of the atrium, differently from the urban villas that it was located in the back of the house [2], [4], [5], [10]-[12].

Plants were also present in the representation of the gardens and inside their compositive elements. In such cases, their symbolic values cannot be neglected, since in ancient cultures the representation of an image was the bearer of a message, which needed to be read in relation to their context to be fully understood [13]-[19]. Particularly, the Roman garden imagery, in life-scale wall frescoes, goes beyond mere decorative landscapes, portraying nature with subtle artistry and distinct influences [20], [21]. For instance, the Garden Room of Livia's Villa at Prima Porta [18], [22]-[24] showcases a nuanced and deliberately Augustan representation of nature, offering further insights into the plant composition and decorative elements of the garden [20].

Furthermore, the phyto-iconographic elements present in the archaeological structures are an important source for the reconstruction of cultural landscapes [13], [25]. The plant representations in architectural structures usually showed the connection with the surrounding green areas in the way to recall the outdoor environment with the form of art. In this way, the importance of iconography, together with palynological, and other archaeobotanical studies, gives relevant information useful to understand the historical and cultural landscape of villas' remains [3], [5], [20], [24], [26]-[30].

Identifying and valorising plant species in ancient gardens are crucial endeavours that provide valuable insight into societies' lifestyles, aesthetic preferences, and horticultural practices [13], [31]. These studies not only unravel the historical context and ecological significance of these gardens but also contribute to the valorisation of ancient gardens' identity for a wider public. Furthermore, archaeobotanical data can give controversial results in areas having great anthropic disturbance [32], such as soil removal and mixing, or where the remains of original earth deposits in the archaeological objects were absent, such as in the case of the suburban *Villa della Piscina in Centocelle* (Rome).

Considering such elements, we studied from an iconographical and historical point of view the archaeological fragments of paintings from such suburban villa to identify the plant forms that can contribute to the increase in botanical/naturalistic knowledge of the site. We also tested the usefulness of the derived information with previous data for the reconstruction of the adjacent greenery, above all of the gardens present in the ancient villa.

2. MATERIALS AND METHODS

2.1. *Study area:* Villa della Piscina

Villa della Piscina, which dates back to the period of the late Republican age (3rd-4th century BC until the second half of the I century BC) with different stages of construction, is located in the Centocelle Park, in the eastern area of the suburbs of Rome (Figure 1). It was discovered in 1930, on the occasion of the preparation of the military airport [33]. During the archaeological excavations performed between 1996-1999 under the guidance of the Capitoline Superintendence for Cultural Heritage of Rome, a very large complex, of about 25,000 m^2 was discovered. The archaeological data report several building phases and changing activity during the time from its foundation to the end [34]-[37]. The building was linked to a large productive fundus, mainly cultivated as vineyard.

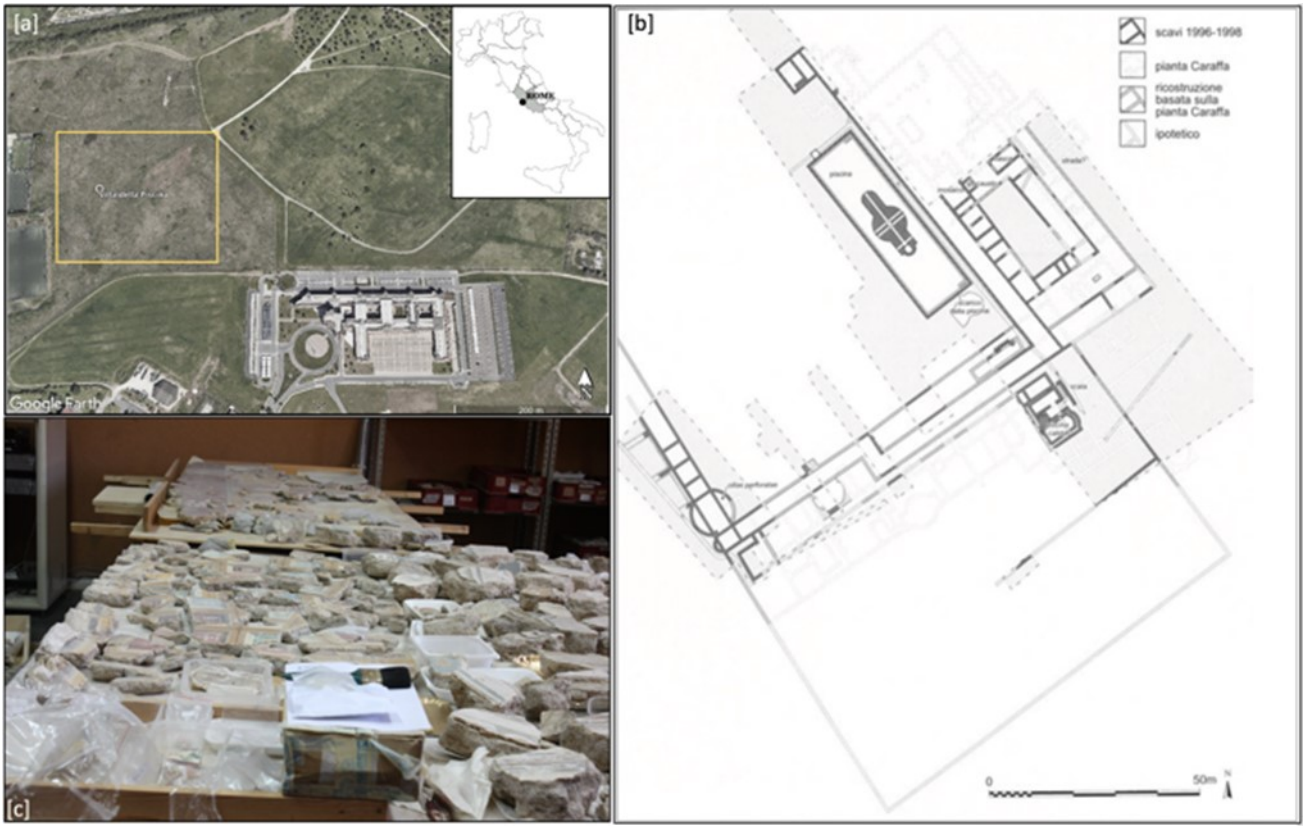

Figure 1. Study area. [a]Placement of *Villa della Piscina* in the archaeological park; [b] Planimetry of the Villa; [c] studied fragments discovered by archaeological excavations.

The peristyle, a columned porch, included and closed the garden. The green space was divided into small geometric areas bordered by evergreen brush species and paths [38]. The garden included a lot of different architectural elements such as statues, marble, and decorated seats, with decorative roles to increase the aesthetic feeling, but much more spiritual and ritual values. The given name of the villa refers to the presence of a wonderful pool, surrounded by a decorative mural painting, which was found during the excavation together with the main building and probably a fountain [36], [37]. The porch walls generally were decorated with frescos representing mythological scenes, gods or natural elements, and landscapes.

Within the geomorphological study of the Centocelle area [34], [35] the highly probable existence of other ancient villas, and settlements was suggested, and hypotheses were made about the potential landscape units, as follow:

- Deep volcanic plains suitable for agriculture (cereals, vineyards)
- Plains with moderately deep volcanic soils on pozzolan layers, suitable for cereals and orchards, moderately suitable for vineyards
- Slight incisions in the plains with deep soils particularly suited for cereals
- Slopes in pozzolana or lithoid tuff with shallow soils moderately suited only for orchards and olive groves
- Sub-flat or slightly sloping valleys; particularly suited to cereals, and possibly along the edges to olive groves and orchards
- River valley floors, flat, suitable for cereals but not for orchards and olive groves.

Most of the area was assessed as suitable for the cultivation of cereals and orchards, while vineyard cultivation was less likely due to the shallow depth of the soil. Archaeological remains found in the area confirm agricultural activity; these are parallel trenches dug into the tuff used for cultivating plants at the right depth. Those found near Villa della Piscina indicate the presence of vineyards.

2.2. Data collection

We analysed the archaeological materials recovered in the excavation campaigns that were carried out between 1996 and 1999. The studied remains were fragments belonging to wall and ceiling structures in the thermal sector and in the boiler pool area, decorated with paintings and stuccoes. Most of them can be dated to the period between the first half of the 2nd and the middle of the 1st century BC, but it was not possible to establish the relationships and possible connections between the fragments, such as typology, location, and environment of their origin [37].

2.3. Identification of the botanical elements and attribution of their horticultural and symbolic uses

The identification phase of the represented plants included at first the observation of specific plant elements and diagnostic morphological elements (Typology, shape, size, and colour of fruits and flowers, and the morphology and layout of the leaves) [22], [39] and then a comparison of such elements with the iconographic sources arising from the botanical platform of GBIF-Global Biodiversity Information Facility [40], World Flora online [41] and botanical diagnostic keys [42]. Later, we also performed a comparison among our identification with the species derived from the related naturalistic iconography of artworks and archaeological remains the Roman times [3], [5], [10], [22]-[24], [26]-[30], [38], [43]-[49].

The reconstruction of the plant uses in the gardens was derived from previous analysis on Roman gardens carried out trough archaeobotanical [3], [46], [48], [49] and phyto-iconographical data of several ancient villas, in Rome [18], [22], [24], *Pompeii*, *Oplontis* and *Herculaneum* [5], [23], [29], [30], [38], [43]-[51].

The attribution of the symbolic values of the identified plants was performed considering the botanical historical literature reporting mythology and plant symbolism [24], [28], [52]-[60].

In the same way, we also considered the original literary and scientific references related to the classical botanical history *Naturalis Historia* [54], *Historia plantarum* [55], *Aeneid* [56].

2.4. Hypothesis of garden composition of *Villa della Piscina*

By integrating the data from the list of plant species identified in the villa fragments with the list of plants most commonly cultivated in Roman gardens, we have been able to suggest the most likely species for reconstructing the garden of this lost villa.

3. RESULTS AND DISCUSSION

3.1. Identification of the botanical elements and attribution of their horticultural and symbolic uses

The analyses of the botanical representations on archaeological material showed the presence of about twenty different plants, some of them not securely identifiable at a species level, both for the lack of diagnostic characteristics, the state of conservation, and for the nature of the fragments. Table 1 lists the 16 identified species together with their biological forms, chorological type, such as horticultural and symbolic value.

The painted or carved plants (Table 1) showed a prevalence of Mediterranean and Euri-Mediterranean species, although plants of Eastern (Caucasus and subtropical elements), and of Western origin (Atlantic) were also present.

Leaves prevailed in the representations, followed by flowers and inflorescences.

Such listed plants had a role in the garden composition [5], [22], [23], [26], [27], [37], [43]-[51], [54]-[56], [61], that can be grouped: plants for hedging the flowerbeds, ground cover plants, flowering plants and ferns for inside the beds, shade "trees" and tree-lines, climbing and shade plants (in-ground/pots) and, aquatic plants.

Laurus nobilis (Figure 2_2) and *Buxus sempervirens* (Figure 3_6), for example, were the species used to decorate and border the flowerbeds. *Hedera helix* (Figure $2_{6a\text{-}b}$) and *Viola* sp. (Figure 3_7) were grown to cover the ground among other species, and *Iris* sp. (Figure 3_2), and *Lilium* cfr. *candidum* (Figure 3_3), as flowering plants. Palms, as *Phoenix dactylifera* (Figure 2_4) and arboreal species, such as *Cupressus sempervirens* (Figure 2_1), *Pinus* cfr. *pinea* (Figure 3_1), and *Platanus orientalis* (Figure 2_9), were also recurrent in the Roman gardens to tree-lined or in sacred woodland. The climbing species, e.g., *Hedera helix* and *Vitis vinifera* (Figure 2_7) were grown in the ground or in pots near the columns and pergolas to create shadow. In the vast pool of the garden, along with the other aquatic plants, species of the genus *Nymphaea* (Figure 2_8) were certainly placed. Obviously, it should be emphasized that each of the named species could be cultivated in another context, decorative or productive, as fruit plants, as in the case of *Vitis vinifera*, or for the ornamental flowering in the case of *Lilium*, *Viola*, *Iris*.

For such plants we also paired as main symbolic group [28], [53], the plants linked to the thresholds of the afterlife; solar and salvific elements (*Apollo/Aesculapius*); divine and fertility messages; plants linked to water as the origin of life and, the allusion to the vegetative force (*Dionysus*).

An equal distribution can be observed among the symbolic groups), with a slight prevalence of the solar and salvific elements.

Undoubtedly, the choice and placement of the species in the garden were closely linked to their own symbolic values, which were addressed to augural elements and to Dionysian forces. From a symbolic point of view, it is important highlight the presence of species referred to the idea of vegetative forces (*H. helix, V. vinifera*)[28], [53], and of plants representing goodness and fertility (*Dracunculus vulgaris* (Figure 3_4), *Iris* sp. pl., *Lilium* cfr. *candidum*, *Pinus* cfr. *pinea*). Similarly, we also found species related to solar divinity or to healthiness (*C. sempervirens*, *L. nobilis*, *Malva* sp. pl. (Figure 2_3), *P. dactylifera*, *Verbascum* cfr. *sinuatum*), such as the ones related to underground world (*B. sempervirens*, *Populus alba* (Figure 3_5), *Viola* sp.). Indeed, in particular, the *Verbascum* was related to the shine as a plant used as a wick for oil lamp or as a proper candle [28]. Securely, in the context of pool, plants symbolically linked to the water, such as *Nymphaea* cfr. *alba*, and *Platanus orientalis* (Figure 2_9) were also present.

We can also underline that *Dracunculus vulgaris* and *Verbascum* cfr. *sinuatum* were not reported in the list of plants painted or carved in the Roman Villas [3], [5], [10], [22], [24], [26]-[30], [38], [43]-[51], [62] whereas both species have been identified in the *Ara Pacis* [28]. The characteristic lanceolate spathe with ondulating edge of violet-purple colour of the *Dracunculus*, leave no doubt about its identification. In the same way, the detail representation of the wavy-edged leaves of the mullein could be the right interpretation of the *Verbascum sinuatum* leaves.

We can clarify the data by acknowledging that certain aspects of the stuccos and frescoes have been understudied and overlooked, leading to the recent identification of two previously unrecognized species.

3.2. Hypothesis of garden composition of *Villa della Piscina*

Our database on the flora of the ancient Roman gardens counts about 180 species. Indeed, the floristic composition changed along with the evolution of the gardens. It varied according to the historical period, geographical factors, and the type of garden, also considering the multiple uses of many species. Literary sources addressing this issue give rise to a large group of uncertain species due to the unclear nomenclature, such

Table 1. The plant species identified on plaster, stucco and fresco painting fragments of *Villa della Piscina*
[* the identification of this species is based on previous knowledge of the authors about the use of this plant in the iconography and gardens of the Roman period].

Plant taxa and Represented parts	Life forms /chorological type	Fragment type and position	Horticultural uses	Symbolic values
***Buxus sempervirens* L.** (Buxaceae), leaves	NP/ P caesp, Subatl./ Submedit.	Fresco, garland	Plants for hedging for flowerbed	The plants linked to the thresholds of the afterlife
***Cupressus sempervirens* L.** (Cupressaceae), scaly leaves	P scap, Euri-Medit.-Orient.	Fresco, border	Shade "Trees" and Tree-line	Solar and salvific elements
***Dracunculus vulgaris* Schott** (Araceae), inflorescence	G rhiz, Steno-Medit.	Fresco	Flowering plants and ferns for inside the beds	Divine and fertility messages
***Hedera helix* L.** (Araliaceae), branches, leaves, flowers/inflorescence	P lian, Subatl./ Submedit.	Fresco, garland	Climbing and Shade Plants (In-ground/pots); Ground cover plants	The allusion to the vegetative force (*Dionysus*)
***Iris* sp. pl.** (Iridaceae), flower	G rhiz	Stucco reliefs, frame	Flowering plants and ferns for inside the beds	Divine Messages
****Laurus nobilis* L.** (Lauraceae), flower	P caesp/ P scap, Steno-Medit.	Fresco, garland	Plants for hedging for flowerbed	Solar and salvific elements
***Lilium* cfr. *candidum* L.** (Liliaceae), flower	G bulb, E-Medit.	Stucco reliefs, frame	Flowering plants and ferns for inside the beds	Divine and fertility messages
***Malva* sp. pl.,** (Malvaceae) flower	H bienn, Steno-Medit.	Stucco reliefs	Flowering plants and ferns for inside the beds	Solar and salvific elements
Nymphaea* cfr *alba (Nymphaeaceae), flower	I rad	Fresco, garland	Aquatic plants	Plants linked to water as the origin of life
***Phoenix dactylifera* L.** (Arecaceae), leaves	P scap, Paleosubtrop.	Fresco	Shade "Trees" and Tree-line	Solar and salvific elements
***Pinus* cfr. *pinea* L**. (Pinaceae), cone	P scap, Euri-Medit	Fresco, border	Shade "Trees" and Tree-line	Divine and fertility messages
***Platanus orientalis* L.** (Platanaceae), leaves, inflorescence/ infructescence	P scap, SE-Europ.	Fresco, garland	Shade "Trees" and Tree-line	Plants linked to water as the origin of life
***Populus alba* L.** (Salicaceae), branches, leaves	P scap, Paleotemp.	Fresco	Shade "Trees" and Tree-line	The plants linked to the thresholds of the afterlife
***Verbascum* cfr. *sinuatum* L.** (Scrophulariaceae), leaves	H bienn, Euri-Medit.	Stucco reliefs, frame	Flowering plants and ferns for inside the beds	Solar and salvific elements
***Viola* sp.** (Violaceae), flowers	H ros	Fresco, garland	Flowering plants and ferns for inside the beds	The plants linked to the thresholds of the afterlife
***Vitis vinifera* L.** (Vitaceae), fruits, leaves	P lian, Uncertain origin	Fresco, garland	Climbing and Shade Plants (In-ground/pots)	The allusion to the vegetative force (*Dionysus*)

Figure 2. The plant species identified on the archaeological fragments of the *Villa della Piscina* in relation to their symbolic value. 1) *Cupressus sempervirens* L., 2) *Laurus nobilis* L., 3) *Malva* sp. pl., 4) *Phoenix dactylifera* L., 5) *Verbascum* cfr. *sinuatum* L., 6a,b) *Hedera helix* L., 7) *Vitis vinifera* L. 8) *Nymphaea* sp., 9) *Platanus orientalis* L.

as the use of a generic name for a group of various species [38,58], and to the uncertain origin of plant material found in gardens during archaeobotanical excavations, etc.

The floristic composition of the Roman garden was characterized by the dropping of native (*Laurus nobilis, Myrtus communis, Populus alba, Quercus ilex*) and non-native species (*Phoenix dactylifera*, *Nymphaea alba*) [3], [5], [43], [46], [50]. The latter have been introduced both from near and far lands had an important religious and ritual role and their rarity and peculiarity representing a status symbol of the property. *Platanus orientalis* and *Cupressus sempervirens* were probably diffused by Greeks and cultivated even in larger areas beyond private gardens [63], [64]. The pines, and especially *Pinus pinea* were probably introduced by the western Mediterranean area, but its original area its now uncertain yet [65]. The date palm (*Phoenix dactylifera*) introduced from the Near East, and the *Lotus/Nymphaea* type (Nymphaeaceae) were among the most widespread exotic plants.

The trees were dropped both for their shadow capacity and for their fruit productivity (*Olea europaea*, *Malus* sp., *Prunus* sp. pl., *Pyrus* sp. etc.). The age of the trees was very important, because the presence of old plant demonstrated the linking with the previous generation of property that they took care and made them grow. In the ritual ceremony, the leaf and the branch of these trees were taken, burned and eaten the fruit in relation to their meaning [3], [62]. *Viburnum tinus*, *Ruscus aculeatus, Salvia rosmarinus*, *Rosa gallica*) were usually used to border the green areas. Moreover. the climbing plants (*Vitis vinifera, Hedera helix*), covered the bowers and also walls and columns to create shadow in the garden. Flowering plants were also cultivated in production gardens for use in festivals and rituals, making garlands and crowns. Common varieties included *Lilium martagon*, *L. candidum*, *Papaver rhoeas*, *Vinca minor*, irises, *Bellis perennis*, evidenced in garden paintings. Evergreen plants were a Roman favourite for their continuous green appearance, ideal for combinations with flowering plants and ensuring a pleasant aesthetic throughout the year. Common ones included *Buxus sempervirens*, *Hedera helix*, *Myrtus communis*, *Nerium oleander*, *Rosmarinus officinalis*, *Viburnum tinus*, *Cupressus sempervirens*, and *Juniperus communis*.

It is important consider that in the ancient Roman garden not only ornamental species were included (always accompanied by a certain symbolic meaning), but also those identified as typical for utilitarian and productive gardens. In this way, we propose a summary list of species, that combines the most representative species of the Roman gardens and the species identified of the frescos and stuccos (signed with *), and that are useful in a reconstruction plan of the villa's garden. The list is organized in a use's way:

1.Plants for hedging:
1.1 Low Hedge
**Buxus sempervirens* L.
Juniperus communis L.
Myrtus communis L.
Viburnum tinus L.
1.2 High Hedge
**Laurus nobilis* L.
Nerium oleander L.
Arbutus unedo L.
Punica granatum L.
2. Ground cover plants:
**Hedera helix* L.
**Viola* sp.
Vinca major L.
3. Flowering plants and ferns for inside the beds:
Acanthus mollis L.
Anthemis arvensis L.
Centaurea cyanus L.
Bellis perennis L.
Campanula rapunculus L., *C. micrantha* Bertol.
Cerastium tomentosum L.
Dianthus caryophyllus L.
Glebionis coronaria (L.) Spach
**Iris* sp. (*Chamaeiris foetidissima* (L.) Medik. / *Limniris pseudacorus* (L.) Fuss)
**Lilium candidum* L.
Lychnis sp. (L. flos-cuculi L.)
**Malva* sp. pl.
Matthiola incana (L.) W.T. Aiton
Narcissus sp. (*N. poëticus* L. /*N. tazetta* L.)
Papaver rhoeas L.
Papaver somniferum L.
Phyllitis scolopendrium (L.) Newman
Rosa centifolia L./*Rosa* sp.
Ruscus aculeatus L.
Salvia rosmarinus Spenn.
4. Shade Trees and tree-lines
Celtis australis L.
**Cupressus sempervirens* L
**Phoenix dactylifera* L.
**Pinus pinea* L.
Pinus halepensis Mill.
**Platanus orientalis* L.
**Populus alba* L.

Quercus ilex L.
Quercus robur L.
5. Climbing and Shade Plants (In-ground/pots):
**Hedera helix* L.
**Vitis vinifera* L.
6. Fruit Trees (also providing shade):
Castanea sativa Mill.
Ceratonia siliqua L.
Corylus avellana L.
Cydonia oblonga Mill.
Ficus carica L.
Juglans regia L.
Malus sylvestris (L.) Mill.
Morus nigra L.
Olea europaea L.
Prunus sp. pl.
Pyrus communis L.
Sorbus domestica L.
7. Aquatic Plants:
**Nymphaea alba* L.
8. Plants for Culinary Use:
Allium ampeloprasum L. / *A. sativus* L.
Atriplex hortensis L.
Apium graveolens L.
Asparagus officinalis L./*A. acutifolius* L.
Brassica rapa L. subsp. *campestris* (L.)
Brassica oleracea L.
Brassica nigra (L.) W.D.J.Koch
Coriandrum sativum L
Anethum foeniculum L.
Pastinaca sativa L.

4. CONCLUSIONS

The close bond between humans and nature meant that plants were not only represented indoors as decorative elements but also held significant symbolic value that cannot be overlooked and must be interpreted within their context. Our analysis of these naturalistic elements aids in understanding the historical landscape they represent. The variety of plant species carved on the fragments serves more than a decorative purpose. Their selection and arrangement are deliberate, often reflecting the environment and carrying symbolic meanings. The presence of both native and introduced species underscores the Romans' extensive botanical knowledge and their ability to incorporate and cultivate plants from across their empire. The choice and arrangement of plants reflected broader cultural and historical trends, such as the empire's expansion, which impacted horticultural practices.

We identified approximately twenty different plants in the botanical representations on archaeological material, noting a predominance of species with Mediterranean distribution and a balanced representation of symbolic groups, with a slight emphasis on solar and salvific elements. The discovery of two previously unidentified species underscores the need for a more detailed analysis of parts of the artwork that may have been neglected or received less attention. This identification effort, supported by iconographical and historical sources, allows us to recognize plant forms that enhance the botanical and naturalistic knowledge of the site. The study of botanical iconography has proven useful for reconstructing the garden adjacent to the suburban villa.

Figure 3. The plant species identified on the archaeological fragments of the *Villa della Piscina* in relation to their symbolic value. 1) *Pinus* cfr. *pinea* L., 2) *Iris* sp. pl. 3) *Lilium* cfr. *candidum* L., 4) *Dracunculus vulgaris* Schott., 5) *Populus alba* L., 6) *Buxus sempervirens* L., 7) *Viola* sp.

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