arts

MDPI

Article

Citrus: From Symbolism to Sensuality—Exploring Luxury and Extravagance in Western Muslim *Bustān* and European Renaissance Gardens

Diego Rivera [1,*], Julio Navarro [2], Inmaculada Camarero [3], Javier Valera [1], Diego-José Rivera-Obón [4] and Concepción Obón [5]

[1] Departamento de Biología Vegetal, Facultad de Biología, Universidad de Murcia, Campus de Espinardo, 30100 Murcia, Spain; javier.valera.martinez@gmail.com
[2] Laboratory of Archaeology and Architecture of the City, Escuela de Estudios Árabes (CSIC), Cuesta del Chapiz, 22, 18010 Granada, Spain; julionavarro@eea.csic.es
[3] Contrato Investigador con Cargo a Proyecto, Departamento de Historia Medieval y Ciencias y Técnicas Historiográficas, Facultad de Filosofía y Letras, Campus Universitario de Cartuja, 18071 Granada, Spain; inmacamcastellano@gmail.com
[4] Faculté Jean Monnet, Université Paris-Saclay, 54 Boulevard Desgranges, 92230 Sceaux, France; dieguitojos@gmail.com
[5] CIAGRO (Instituto de Investigación e Innovación Agroalimentario y Agroambiental), EPSO (Escuela Politécnica Superior de Orihuela), Universidad Miguel Hernández de Elche, 03312 Orihuela, Spain; cobon@umh.es
* Correspondence: drivera@um.es; Tel.: +34-868884994

Abstract: This study delves into the multifaceted realm of citrus fruits, exploring their significance and socioeconomic implications from their early introduction to Western Muslim and Renaissance gardens, tracing their journey throughout history. Employing a multidisciplinary approach, drawing from biological, archaeobotanical, iconographic, and textual sources, our study offers a comprehensive exploration of citrus symbolism and cultural significance, integrating historical, artistic, horticultural, and socioeconomic viewpoints. The genus *Citrus* (Rutaceae) comprises around thirty species and its natural habitat spans from the southern slopes of the Himalayas to China, Southeast Asia, nearby islands, and Queensland. Originating from only four of these species, humans have cultivated hundreds of hybrids and thousands of varieties, harnessing their culinary, medicinal, and ornamental potential worldwide. We delve into the symbolic value of citrus fruits, which have served as indicators of economic status and power. From their early presence in Mediterranean religious rituals to their depiction in opulent Roman art and mythical narratives like the Garden of the Hesperides, citrus fruits have epitomized luxury and desire. Christian lore intertwines them with the forbidden fruit of Eden, while Islamic and Sicilian gardens and Renaissance villas signify their prestige. We analyze diverse perspectives, from moralists to hedonists, and examine their role in shaping global agriculture, exemplified by rare varieties like *aurantii foetiferi*.

Keywords: orange; lemon; citron; lumia; iconography; botanical collections; archaeobotany; lexicography; almunias; Rome; Norman kingdom of Sicily

check for updates

Citation: Rivera, Diego, Julio Navarro, Inmaculada Camarero, Javier Valera, Diego-José Rivera-Obón, and Concepción Obón. 2024. Citrus: From Symbolism to Sensuality—Exploring Luxury and Extravagance in Western Muslim *Bustān* and European Renaissance Gardens. *Arts* 13: 176. https://doi.org/10.3390/arts13060176

Academic Editor: Andrew M. Nedd

Received: 17 July 2024
Revised: 11 November 2024
Accepted: 13 November 2024
Published: 21 November 2024

Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

1.1. Overview of the Genus Citrus and Its Historical Significance

The genus *Citrus* (Rutaceae) comprises around thirty species and its natural habitat spans from the southern slopes of the Himalayas to China, Southeast Asia, nearby islands, and Queensland in Australia (Luro et al. 2017; POWO 2024).

Starting from only four or five of these species, despite these humble origins, humans have developed and utilized hundreds of hybrids and thousands of varieties, exploiting their culinary, medicinal, and ornamental potential across temperate and tropical regions globally.

Citrus fruits play a pivotal role in global agriculture. Major commercial citrus species include sweet oranges (*Citrus* × *aurantium* var. *sinensis*), mandarins (*C.* × *aurantium* var. *deliciosa*, *C.* × *aurantium* var. *clementina*, *C. reticulata* and *C.* × *unshiu*), grapefruit (*C.* × *aurantium* var. *paradisi*), and lemons (*C.* × *limon*) (Figure 1). Globally, citrus cultivation significantly contributes to agricultural output, encompassing a harvest area spanning all continents and covering approximately 105,529.6 square kilometers, a landmass akin to the total area of Portugal or South Korea (FAO 2022).

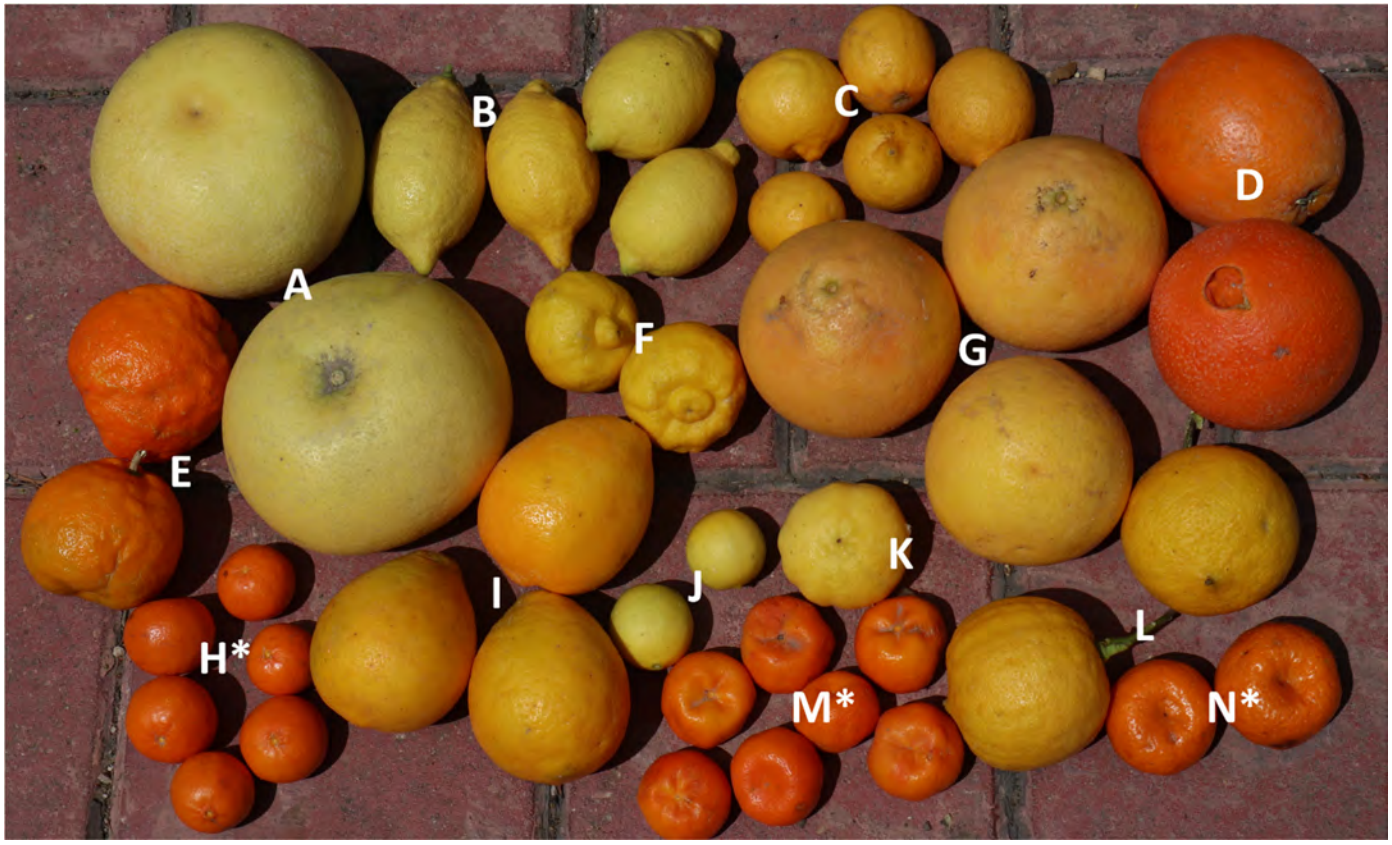

Figure 1. Citrus diversity: A. pummelo (*Citrus maxima*); B. lemon of Amalfi (*C.* × *limon* var. *limon*); C. lemon "Feminello" (*C.* × *limon* var. *limon*); D. navel orange (*C.* × *aurantium* var. *sinensis*); E. sour orange (*C.* × *aurantium* var. *aurantium*); F. limetta (*C.* × *limon* var. *limetta*); G. grapefruit (*C.* × *aurantium* var. *paradisii*); H*. clementine (*C.* × *aurantium* var. *clementina*). I. Peretta lemon (*C.* × *limon* var. *limon*). J. Lime (*C.* × *aurantiifolia*). K. mellarosa (*C.* × *mellarosa*). L. bergamot (*C.* × *bergamia*); M*. sour mandarin (*C. reticulata*); N*. mandarin "Tardivo de Ciaculli" (*C.* × *aurantium* var. *deliciosa*). Image by Diego Rivera. Note: (*) taxa unlikely to have been present in the Mediterranean before 19th century CE.

1.2. Introduction to the Mediterranean Origins of Citrus Cultivation

The morphological diversity of the leaves and fruits (IPGRI 1999), together with their perfume and notably, that of the flowers, as well as the simultaneity of the ripening of the fruits with the following flowering in many cases, are the main characteristics of citrus trees. They have attracted the attention of the various cultures that have succeeded each other in the region since their introduction in the Mediterranean in the early 1st millennium BCE, initially as exotic commodities reserved for the elite, featuring prominently in religious rites such as the use of the Etrog citron during the Israelites' Feast of Tabernacles.

1.3. Citrus Fruits as Symbols of Luxury and Status, Aims of This Review

Their golden hue, ranging from lemon yellow to deep orange occasionally tinged with red, earned these fruits an association with the golden apples or oranges of the Hesperides and, in a sense, with the fruits of Paradise. Their scarcity or rarity, along with the difficulty of cultivation due to their requirements for fertilizer, abundant watering, and the need for winter chill but frost-free conditions, coupled with the necessity of intense summer heat, made citrus plants highly coveted by authorities, the powerful, and those wealthy enough to afford them. Their exoticism made them stand out in Roman villas, the gardens of the Western Muslim world, and Renaissance villas, not only as individual specimens but also as extensive collections, which were pampered and required the expertise of the best gardeners of each era (Tolkowsky 1938).

Our objective in this study is to reconstruct the thread of this history and to assess the artistic, historical, and archaeological importance of citrus fruits, which renders them a significant element of the cultural heritage of the Mediterranean.

This research advances the scholarly understanding of citrus species in Mediterranean cultural history through a novel interdisciplinary methodology that integrates botanical and archaeological evidence, artistic representations, and textual sources. By examining the diachronic development of citrus symbolism and utilization, particularly *Citrus medica* L., this study provides critical insights into the complex processes of botanical–cultural integration in the ancient, medieval, and Renaissance Mediterranean world.

This investigation's significant contribution lies in its comprehensive analytical framework, which synthesizes Mediterranean citrus biodiversity, archaeobotanical findings, iconographic analysis, and historical documentation to illuminate the multifaceted role of citrus species in shaping religious practices, artistic traditions, and socioeconomic patterns. This methodological approach enables a more nuanced understanding of how botanical elements acquire and transmit cultural significance across temporal and geographical boundaries, thereby enriching both ethnobotanical scholarship and Mediterranean cultural studies.

2. Results

2.1. Early Introduction of Citrus Fruits: The Mediterranean Origins of Citrus Cultivation

The oldest description of a citrus fruit in a Western text seems to be that of Theophrastus in *Enquiry into Plants* (chapter 4.4.1), c. 310 BCE, where he mentions its perfume, its moth-repellent and medicinal properties, and its repeated blooming, as well as how to sow its seeds (Hort 1916a, 1916b; Barbera 2023). In his *Natural History* (12.7.2) in the 1st century CE, Pliny the Elder echoes these texts, adding the usefulness of cultivation in pots. We must not forget that the term citrus was also used in antiquity, including by Pliny, to name the cedars, their wood, and resin (Rackham 1945).

One Punic funeral vase dated to the 5th century BCE, found in the necropolis of Monte Sirai (Sardinia, Italy) seems to have contained the residue of a product derived from *Citrus* sp. (Frère et al. 2012), but there is no further information.

Analysis of testa surfaces and cell patterns suggests the identification of *C.* cf. *medica* (citron) in Pompeii (3rd–2nd century BCE) and *C.* cf. *limon* (lemon) in Rome (Roman Forum, 1st century BCE), while *Citrus* pollen grains have been identified at the site of Cuma (Italy) from levels starting at the 8th century BCE (Pagnoux et al. 2013).

These two citrus fruits (lemon and citron), along with their hybrids known as citron–lemon, would later in Renaissance gardens be sufficient to account for 63.01% of the diversity in the Barberini collections (Ferrari 1646), 51.47% of the Nuremberg gardens (Volkamer 1708), and 63.72% of the Medici collections in Florence (Baldini and Sacaramuzzi 1982).

2.2. The Religious and Cultural Significance of Citrus in Jewish Tradition: A Historical Analysis from Classical Antiquity to the Renaissance

2.2.1. The Origins and Early Ritual Applications of *Citrus medica* L.: Archaeological and Historical Evidence from the Ancient Near East

Archaeological evidence for the earliest cultivation of *Citrus medica* L. in the Levant has been documented at Ramat Rahel, a Persian-period royal garden complex near Jerusalem, dating to the 5th–4th centuries BCE. This discovery suggests that the species' introduction followed established trade routes from its center of origin in India through Persia to the Eastern Mediterranean. The subsequent cultural integration of *C. medica* into Jewish traditions represents a significant example of botanical–religious assimilation in the ancient Near East (Langgut 2015, 2017).

Notably, *C. medica* is absent from biblical texts, and its theological significance emerged later through rabbinic interpretation. The identification of citron as the *Prî ëc hädär* (פְּרִי עֵץ הָדָר) referenced in Leviticus 23:40—traditionally translated as "fruit of the goodly tree"—was established during the first century CE and substantiated through multiple hermeneutical analyses of the biblical text, marking a pivotal moment in the species' ritual incorporation into Jewish practice (Langgut 2015, 2017).

The Talmudic tractate *Sukkah*, specifically its third chapter, provides extensive halakhic discourse on the *arba'at ha-minim* ("four species"), with particular emphasis on *Citrus medica* L., known in Hebrew as etrog (plural: etrogim). For ritual validity, specific morphological criteria must be satisfied: the specimen must exhibit the characteristic elongated pyriform [or ovate] shape, with an intact peduncle, and optimally, the presence of the pistillate remnant (*pitam*). Additional requisite characteristics include complete structural integrity, appropriate maturity, distinctive citrine coloration, and the absence of superficial or structural imperfections (Goldschmidt 2023).

2.2.2. The Ritual Persistence of *Citrus medica* L.: Cultural Continuity and Adaptation Among Diaspora Jewish Communities in Medieval Europe

The need to use the fruit of the citron at the Feast of Tabernacles, year after year, for centuries, led the Hebrew communities to develop its cultivation where they could or to buy it, as they did in the 14th and 15th centuries from farmers in Liguria and also in Calabria and Puglia (Barbera 2023).

Talmudic discourse has extensively examined the morphological and aesthetic criteria of *Citrus medica* L., with etymological interpretations linking the Hebrew הָדָר (*hadar*) to the Greek ὕδωρ (*hydor*), thus establishing the etrog's symbolic association with water during Sukkot festivities. The *arba'at ha-minim*'s anthropomorphic symbolism reflects the theological conception of human–nature relationships in Jewish thought. Medieval kabbalistic interpretations subsequently transformed ritual praxis, particularly from the thirteenth century onward, when the etrog's juxtaposition with other ritual species during benedictions came to represent the unity of body and soul, both individual and communal (Hallamish 2023). Maimonides (1135–1204 CE), who was born in Cordoba, wrote on the lulav (Figure 2): "But the four species of the lulav are palm, myrtle, willow, which is arava, and the citron [*toronja* in the Spanish translation by De Toledo (1995)]. These are the four species already mentioned by the sages . . .".

The spread of citron and the associated horticultural arts from Palestine to other Mediterranean shores is an instance of the influence of religion upon the development of the cultural landscape (Isaac 1959a). While citrus cultivation died out in the centuries immediately following the fall of the Roman Empire and was not revived until the Arabs reintroduced it, the citron, despite great difficulties, continued to be grown because it fulfilled a religious obligation for Jews, a segment of the Mediterranean population (Isaac 1959b).

Figure 2. Etrog citrons on coins of the Bar Kokhba revolt in Israel: (**A**) Shekel of Bar Kokhba silver Tetradrachm, undated, attributed to year 3 (134/135 C.E.); (**B**) Copper coin of Israel revolt, 69–70 CE (year 4), etrog (citron) flanked by lulav (bound palm branch, myrtle, and willow) on either side; (**C**) Bar Kochba silver shekel, year 1 of the Freedom of Israel. In both, lulav thrice bound; in left field, etrog; (**D**) Copper coin of Israel revolt, 69–70 CE (year 4), lulav (bound palm branch, myrtle, and willow) flanked by an etrog (citron) on either side; (**E**) Common etrog citron in Florence Botanical Garden. Images: (**A**) by https://coinreplicas.com/product/shekel-of-bar-kokhba-silver-tetradrachm/, accessed on 13 November 2024; (**B**) by https://www.britishmuseum.org/collection/object/C_1908-0110-12, accessed on 13 November 2024; (**C**) by https://coinreplicas.com/product/shekel-of-bar-kochba-silver-tetradrachm-year-1/, accessed on 13 November 2024; (**D**) by https://www.britishmuseum.org/collection/object/C_G-2647, accessed on 13 November 2024; (**E**) by Diego Rivera and Concepción Obón.

2.2.3. The Image of *Citrus medica* L.

The bundle of the "lulav" together with etrog citrons were repeated themes on coins struck during the Jewish uprisings around 70 CE and 135 CE. The earliest numismatic evidence of *Citrus medica* L. appears on coinage issued during the First Jewish–Roman War (66–73 CE), while the Second Temple still stood in Jerusalem. This iconographic

motif was subsequently revived during the Bar Kokhba revolt (132–135 CE), though with notable morphological variations in the fruit's representation across different coin series (Figure 2). The mintages of the first uprising depict the "etrog" in its common ellipsoidal shape (Figure 2B,D), like those cultivated during the Renaissance and today (Figure 2E), while on those minted by Bar Kochba, the etrog citron appears rough and deformed, with a constriction in the middle area (Figure 2C) or rough and conical in shape (Figure 2A).

These numismatic depictions represent the earliest material evidence of the etrog's ritual significance in Jewish culture, predating other archaeological and artistic manifestations by several centuries (Ben-Sasson 2023).

The iconographic representation of *Citrus medica* L. (etrog) demonstrates significant spatial and temporal distribution throughout Jewish material culture from the 3rd century CE onwards. During the Late Antiquity period, etrog imagery appears consistently across diverse media throughout both the Levantine heartland and the Diaspora communities of the Roman Empire, from Dura-Europos to Colonia Agrippina (Ben-Sasson 2012, 2023).

Medieval representations exhibit notable regional variation; while Ashkenazi manuscript illuminations frequently depict the etrog among the *arba'at ha-minim* in Sukkot ritual contexts, Sephardic manuscripts conspicuously omit such imagery. The morphological representation of the fruit shows considerable variation across periods and media, particularly regarding the presence of the pistillate remnant (*pitam*) and the distinctive equatorial stricture (*gartel*), suggesting that artistic depictions may not reflect historical ritual preferences (Ben-Sasson 2023).

The observance of Sukkot, encompassing the construction of ceremonial booths (sukkot) and the ritual use of the lulav—comprising palm fronds, willow branches, and myrtle sprigs—along with the etrog citron, continues to be maintained in contemporary Jewish communities (Figure 3). This ongoing ritual observance has significant implications for the cultivation, harvesting, and post-harvest handling protocols of these botanically diverse ceremonial species (Klein et al. 2016).

The practice of preserving the etrog citron in an ornate receptacle at ambient temperature until complete desiccation, while not universally observed across all Jewish communities, has been documented by the Museum of Sephardic Culture, Toledo, Spain, in both Italian and Moroccan traditions (Figure 3). These ceremonial containers manifest in two primary forms: either as ovoid vessels crafted from chased silver, or as precisely constructed wooden caskets, both designed specifically for this ritual purpose (Figure 3).

2.3. Citrus Symbolism and Representation in Roman Life and Art

2.3.1. Citrus Fruits as Exotic Commodities for the Elite

Vergil, the first Latin author to mention citrus fruit specifically, in 35 BCE, described it as follows: "Media bears the bitter juices and lingering taste of the blessed fruit, that which no other is more efficacious when ruthless stepmothers have poisoned drinking-cups and have mixed herbs with baneful spells. It helps by driving black poison from the body. The tree is large and in appearance closely resembles the laurel, and but for the odor which it widely diffuses it would be a laurel. Its leaves are not dislodged by winds; the flower is particularly tenacious; the Medes banish bad breath with it and cure themselves of persistent asthma." (Barbera 2023).

Lemons or citrons, either singly or together, were cultivated in small urban gardens, emulating the grand villas, where walls were adorned with plant images to expand the illusion of landscape. Among the array of trees depicted in the Frutetto House at Pompeii, a citrus tree was showcased (Barbera 2023).

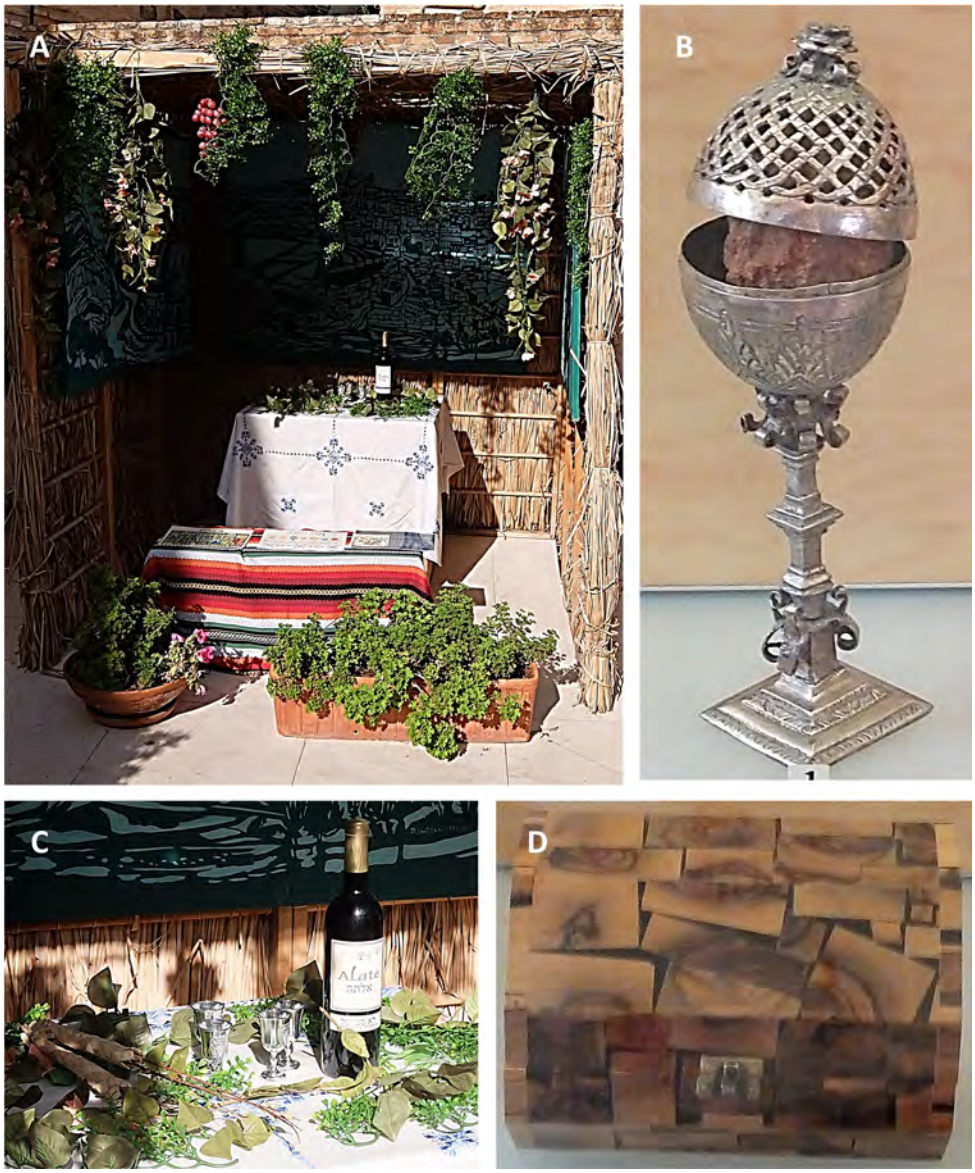

Figure 3. Elements of the Sukkot festival: (**A**) installation from October 2017 recreating a sukkah (ceremonial booth) adorned with flowers and fruits, constructed for the Sukkot festival. The interior displays a table with traditional ceremonial elements, particularly the lulav (palm frond bundle) and etrog citron; (**B**) nineteenth-century Italian silver etrog case; (**C**) Table arrangement featuring lulav bundles and kosher wine; (**D**) twentieth-century Moroccan wooden etrog case. All artifacts photographed at the Sephardic Museum in the 'Synagogue of El Tránsito', Toledo, Spain. Images: (**A**–**D**) by Diego Rivera.

2.3.2. Analysis of Citrus Depictions in Frescoes and Mosaics

In the case of lime, being one of the fruits represented along with other citrus fruits in mosaic 58,596 at the Museum of the Baths of Diocletian (Rome), its introduction to the Mediterranean can be traced back to the early first millennium CE (Tolkowsky 1938).

The House of the Floral Cubicles, also known as the Frutetto House or the House of Euplia, is a domus located at Pompeii. Of particular significance within this residence are three rooms adorned with frescoes. The second cubiculum to the left of the atrium features depictions of a garden, showcasing oleanders, laurels, myrtles, lemons (Figure 4), and cherry trees, creating the illusion of being within a white pergola overlooking this garden. Birds are depicted flying among the plants, while small images within the scenes depict Dionysian or Egyptian motifs (Barbera 2023).

Figure 4. Lemons in Casa del Frutetto (Pompei Italy) 1st cent CE. (**A**) Depiction of a fruit garden adorning the walls within the hall; (**B**) Specific focus on the lemon tree's fruiting (*Citrus* × *limon* var. *limon*), demarcated by a white rectangle in image (**A**). Images by Diego Rivera and Concepción Obón.

According to Borgongino (2006), evidence for the presence of citrus fruits in Pompeii, destroyed in 79 CE, is overwhelming. Remains of bergamot, sweet orange, and lemon have been found, with six varieties of lemons, two varieties of oranges, as well as citron and lime identifiable on wall images in the houses. The diversity of vegetation depicted in Pompeian frescoes has been preserved thanks to extensive reproductions of fresco sections featuring fruits, created by painter Giuseppe Romano around 1965 CE, in the Pompeian Room of the Reggia di Portici (Pasquarella and Borgongino 2005).

The ornamental allure of citrus fruits is underscored in Roman art, adorning frescoes and mosaics in opulent villas across Europe, Asia, and North Africa. In the wall paintings at the Villa of Livia at Prima Porta, constructed about 38 BCE, by a Roman painter named Ludius, famous for having introduced a sense of complete reality into this type of pictorial composition, a tree in one of the paintings is apparently a citron, but with quinces for fruit (Figure 5). It is reasonable to assume that the tree grew in Livia's garden but did not produce fruit (Andrews 1961). However, an alternative view is to identify the fruits as globose

flattened lemons (Figure 5B). We found a remarkably similar representation of globose lemons, together with another branch with citrons, in the mosaic of Villa "La Voliere", Carthage (Tunisia) (2nd cent CE) (Plate 23, Tolkowsky 1938).

Figure 5. Wall paintings at the Villa Livia, Prima Porta (1st century BCE). (**A**) Flat lemon (*Citrus* × *limon* var. *limon*) with quince-like flattened fruits [according to Andrews (1961), it is a citron tree]. (**B**) Flat lemon like the above, collected in 2016 in gardens close to the Avernus Lake, 4 km west of Pozzuoli (Campania, Italy). Images by Concepción Obón and Diego Rivera.

The Roman Villa of Casale is a late Roman villa (285–305 CE) whose remains are in the Sicilian town of Piazza Armerina. Renowned for its extensive mosaics, it is noteworthy for its realistic depiction of citrons and other citrus fruits (Figure 6). We found a similar representation of citrons in the mosaic of Villa "La Voliere", Carthage (Tunisia) (2nd cent CE) (Plate 23, Tolkowsky 1938).

Tolkowsky (1938) identified oranges and citrons in the mosaic ceiling at Saint Constanza (Rome, Italy) built in the second quarter of the 4th century CE for the daughter of Emperor Constantine. The barrel vault of the annular corridor preserves the original 4th century polychrome mosaics, including typical motifs of vines and tendrils.

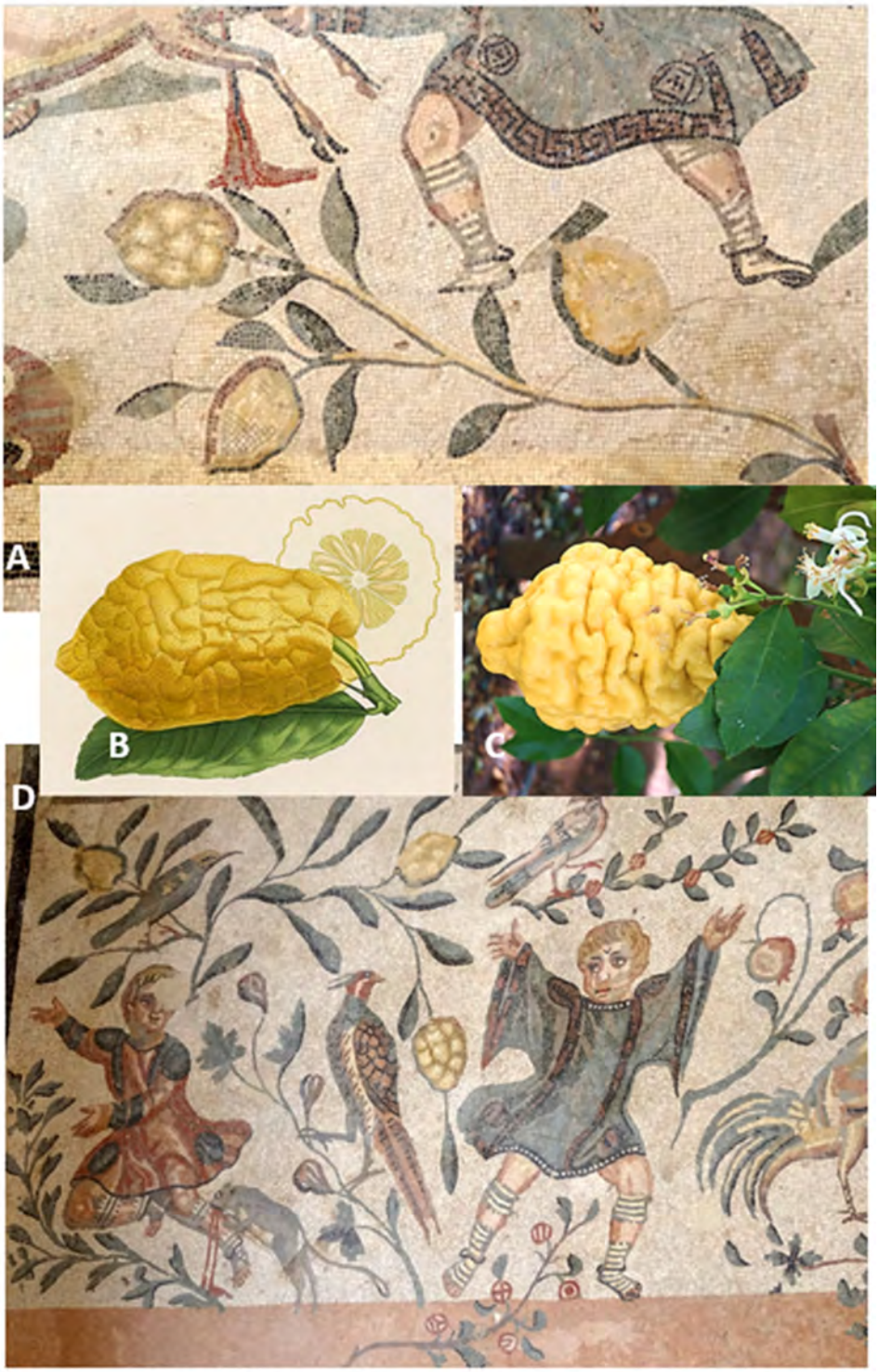

Figure 6. Roman Villa del Casale (Piazza Armerina, Sicily, Italy) mosaics (285–305 CE). (**A**) Mosaic with citron tree branch with citrons; (**B**,**C**) Citron fruits (*Citrus medica*); (**D**) Mosaic with citron tree branches and citrons. Wild mandarins, pomegranate, and fig tree branches. Images: (**A**,**C**,**D**) by Diego Rivera and Concepción Obón; (**B**) by Risso and Poiteau (1818–1822).

Summarizing, Roman artistic representations of citrus fruits manifest primarily through two medium-specific approaches: mosaics and frescoes. Each medium offered distinct advantages in portraying these exotic specimens, while serving complementary roles in Roman visual culture.

Mosaic depictions typically present citrus fruits in two contextual frameworks: as components of still life compositions or as botanical elements within larger hunting scenes featuring exotic fauna. The artistic treatments demonstrate sophisticated technical mastery through naturalistic rendering of texture and color gradation. These works exhibit strategic composition emphasizing the fruits' prestigious status, while incorporating decorative borders and floral motifs. The artisans' careful attention to light effects and dimensional representation further elevates these works beyond mere decorative pieces.

In contrast to mosaics, frescoes situate citrus within garden landscapes, employing second-style Roman painting techniques to create immersive environmental representations. These works are distinguished by their naturalistic depiction of complete citrus trees within garden settings. The integration of architectural elements and complementary flora creates a sense of spatial depth through careful compositional staging. This approach emphasizes environmental context rather than isolated specimen presentation, resulting in a more comprehensive representation of Roman horticultural aesthetics.

The prevalence of citrus imagery in both media reflects their cultural and economic importance in Roman society. These fruits functioned as powerful symbols of wealth and social status, while simultaneously serving as indicators of trade connections with Eastern regions. Their representation in art speaks of their position as coveted luxury goods and their role as elements of idealized natural abundance within Roman culture.

The treatment of citrus subjects reveals distinct methodological differences between these artistic media, despite their shared goal of realistic representation. Mosaics favored schematic, decorative presentations emphasizing individual specimens, whereas frescoes pursued environmental integration, presenting citrus within broader horticultural contexts. Nevertheless, both media achieved a sophisticated balance between naturalistic representation and idealized formal arrangements. Through these complementary approaches, each technique contributed to the Roman artistic tradition of nature representation that combined observed reality with aesthetic idealization.

This dual approach to citrus representation in Roman art provides valuable insight into both artistic practices and cultural values of the period. The methodological differences between mosaic and fresco techniques demonstrate how different media could be employed to emphasize distinct aspects of these prestigious botanical specimens, thereby enriching our understanding of Roman visual culture and its relationship to exotic flora.

2.3.3. Ornamental Value and Symbolic Meanings Associated with Citrus Fruits

The enigmatic aura of the citrus is perpetuated in the mythical Garden of the Hesperides, where depictions of prized fruits, including oranges, evoke notions of opulence and desire. In Christian lore, citrus fruits are entwined with the narrative of Eden's forbidden fruit, giving rise to varietals such as the "pomum Adami". When reporting on the Creation of Early Gods, Hesiod (8th or 7th century BCE) states: "Gave birth to Blame and agonizing Grief. And to the Hesperides who guard the golden apples. And the fruit-bearing trees beyond glorious Ocean" (Fleming 2024).

A relief on the tomb of the Haterii on the Via Labicana, built about 90 CE, represents quinces and citrons, both with leaves and still attached to their respective branches. In the series of wall paintings from Pompeii representing dancing maidens, one carries in her hand a branch with leaves and flowers of the citron tree. A wall painting in the triclinium of the House of the Cryptoporticus at Pompeii represents a basket of fruit, in which one item is a beautiful citron. In the festoons of the House of the Silver Wedding, the polymorphism of the lemon-shaped citron is depicted in three distinct forms. When the archaeological evidence and the testimony of agricultural writers are considered together, the net impression is that the citron tree was introduced into Italy in about the period of Augustus, but for some little time produced no fruit, serving only as an ornamental (Andrews 1961).

The late Roman complex of Casón-Pedregal, dated to the late 3rd or early 4th century AD, includes a mausoleum and various rural buildings situated on the plain of Jumilla (Murcia, Spain) (Noguera 2001). Several terracotta materials have been recovered

from it, now exhibited in the archaeological museum of Jumilla. Among them, the three-dimensional representation of a lemon stands out, found within a context of funerary offerings, emphasizing the symbolic value of the lemon (Figure 7).

Figure 7. Lemon in terracotta (*Citrus* × *limon* var. *limon*), Roman ensemble Casón-Pedregal (Jumilla, Murcia, Spain), Museo Arqueológico de Jumilla. Image by Concepción Obón.

Allegedly from a villa in the Roman city of Tusculum, 2nd century CE, a mosaic depicting various citrus fruits should have been preserved in the Museo Nazionale Romano, number 58,596 (Tolkowsky 1938). We were not able to locate the mosaic but believe it is relevant to reproduce the image of that mosaic that Tolkowsky (1938) used as the frontispiece for his *Hesperides* (Figure 8A).

Figure 8. (**A**) Mosaic from Tusculum, early 2nd cent CE, preserved in the National Roman Museum, with figures of lemons, citrons, oranges, and limettas. (**B**) Mosaic with garlands of fruits, among which we find notably citrons, pointed lemons, and chinottos or other reddish-orange fruit, 2nd to 3rd centuries CE, found in the 1959 excavations in the Plaza de la Corredera (Cordoba, Spain). Images: (**A**) by Tolkowsky (1938) and (**B**) by Diego Rivera.

A Roman mosaic of 364 × 158 cm from the 2nd to 3rd centuries CE, with garlands of fruits, among which we find notably citrons, pointed lemons, and chinottos or other orange-reddish fruit, was found in the excavations in the Plaza de la Corredera (Cordoba, Spain) in 1959 (Figure 8B).

2.4. Citrus in Western Islamic bustān Gardens

2.4.1. Importance of Citrus in Western Muslim *bustān* Gardens

The term "*bustān*" (Persian: بوستان, romanized: *bustān*) is used in Persian and Arabic literature to describe gardens, particularly those featuring fruit trees, flowers, and water elements, evoking a sense of beauty, tranquility, and paradise (Weber 1994; García-Sánchez 1995; Navarro-Palazón et al. 2014, 2018). Unlike the more general terms "garden" or "orchard", "*bustān*" carries deeper cultural and historical significance, especially within Persian and Islamic traditions. It reflects an idealized space that symbolizes harmony and paradise, making it particularly fitting when referring to Islamic gardens in the Western Islamic world.

Additionally, Islamic gardens often have distinct characteristics, such as flowing water, geometric designs, and courtyards, which the term "*bustān*" captures more effectively than broader terms. It is also a word deeply embedded in Persian and Arabic literature, where it has been used for centuries to describe both real and imagined gardens, further enriching its association with Islamic garden ideals.

In this way, "*bustān*" carries not only the aesthetic qualities of Islamic gardens but also the cultural and literary layers that give it a unique and evocative meaning beyond what the word "garden" or "orchard" might convey.

In the Western Islamic and, probably, pre-Norman Sicilian *bustān* gardens, citrus played a pivotal role, serving as symbols of prestige and luxury. Some Andalusian authors recommended planting violets at the foot of citrus trees in gardens, to obtain a sequence of blooms from violets to citrus flowers in late winter and early spring (Barbera 2023). Regarding al-Andalus, the sour orange, together with the lemon, was mentioned for the first time by Ibn Juljul in his additions to Dioscorides' *Materia Medica*, compiled in Cordoba between 982 and 994 CE. Abū ʾl-Khayr al-Ishbīlī (Seville, c. 1150) considered the lemon, pummelo, and sour orange all as cultivars of the citron. The first reference known to lime is that of Abu ʾl-Khayr al-Ishbīlī when referring to it c. 1150 CE (Laca 2003).

Ibn al-ʿAwwām, c. 1150 CE, mentions a list of a dozen varieties of citrus fruits that he classifies into citrons, oranges, pummelos and grapefruits, and lemons. The most diversified citrus fruit in the medieval estates of Western Muslims was the citron, which occasionally included hybrids such as *ponciles* and *lumias.* Ibn al-ʿAwwām (Banqueri 1802; Clément-Mullet 1864; Hernández-Bermejo and García-Sánchez 1988) mentions that there are both sweet (*ḥalū*) and sour (*ḥāmiḍ*) varieties of citrons, and he also mentions the dark color of the shoots of sour citrons, due to the accumulation of anthocyanins. He then describes the large, pointed citron known as "el cordobés (*al-qurṭubī*)", the round, large, smooth citron known as "*el qusṭī*" [for its scent of costus], and the round citron the size of an eggplant, which is sour just like its pulp, known as Chinese citron (*al-ṣīnī*). This last text is incredibly significant because it allows us to understand that when the treatises mention a sweet citron, they refer to the thick edible peel, and it is possible that citrons with bitter peel are included in the concept of "sour".

While Ibn al-ʿAwwām emphasizes the agricultural significance of citrus fruits, he also provides guidance on their ornamental placement, suggesting planting them in the middle of ponds, protecting the trunk from direct contact with water by overlapping sections of ceramic tubes bound with lime and sand, or alongside water channels to create the illusion of being cultivated within water (Banqueri 1802; Hernández-Bermejo and García-Sánchez 1988; García-Sánchez et al. 2021; Barbera 2023). It is curious that the texts of agronomists do not give the impression of the orange tree also being a widely used ornamental species, at most occupying some prominent place in the garden, as Ibn al-ʿAwwām points out (García-Sánchez et al. 2021).

Andrea Navaggero (1983), a Venetian ambassador and visitor to Seville in 1526, described *al-Buḥayra*, known in the 12th century as *Ḥā'iṭ al-Sulṭān* (the Sultan's Orchard) and in the 13th century as *Huerta del Rey*, as follows: "It has a beautiful palace with a large pond, and so many orange trees that their owner earns a huge income from their fruit; in this garden and in others in Seville, I have seen orange trees as tall as our walnut trees". The Sevillan *Buḥayra* site and its gardens were constructed between 1172 and 1196 CE and remained in use until at least the period of Navaggero (Valor 2020).

The Agdal, a royal country estate situated south of Marrakech (Morocco) and connected to the kasbah, traces its origins back to the Almohad era (12th century CE). With a current expanse of 340 hectares, it primarily comprises orchards that have been cultivated continuously for centuries. Within its boundaries, over 40 well-preserved structures and numerous archaeological artifacts have been documented. Notably, the Dar al-Hana enclosure is believed to have served as the residential quarters during the Almohad and Saadian periods. In the southern section of this complex, remnants of a grand Saadian palace, constructed atop an earlier Almohad structure, have been unearthed. Additionally, records indicate the northward expansion of the Agdal and its transformation from an isolated country estate (an almunia) into an adjunct of the kasbah. Archaeological surveys conducted in the Tasltante plain adjacent to the Agdal have facilitated the delineation of a model for country estates and settlement patterns, akin to those observed in this royal property. Currently, its area has been reduced to about 340 hectares, which remain in full production, primarily planted with olive trees, citrus fruits, and pomegranates, crops documented as far back as the Almohad period. Its subdivision into orchards separated by walls seems to date back to at least the Saadian period (Navarro-Palazón et al. 2013).

When enumerating the gates of the kasbah, Al-Umari (1301–1349 CE) first mentions the *Bāb al-bustān* (Gate of the Garden), which connected the palace with a large estate outside the walls located to the south of the palatial city. "[*The kasbah*] has three gates exclusive to it: [the first being] the Gate of the Garden [*Bāb al-bustān*], which is reserved for the Sultan's family members; it gives access to a garden [*bustān*] called the Buhayra; . . .a pool. . . surrounded by four hundred orange trees [likely sweet edible oranges], separated either by lemon trees or by flowers (*azhār*) [notably the flowers of the sour oranges]" (Navarro-Palazón et al. 2013; Navarro-Palazón and Garrido 2018; Navarro-Palazón and Puerta 2018). However, another interpretation of (*azhār*) here could be myrtle (Navarro-Palazón et al. 2017).

Abd-al-Aziz ibn Muhammad al-Fishtali (1549–1621 CE), vizier of Al-Mansur and official historiographer, describes it as follows: ". . .separated lengthwise and widthwise by avenues lined with aromatic plants and trees: myrtles, lemon trees, elderberries [*jabur*], rose bushes, *nisrin* [a different rose type], jasmines, and a forest of countless olive trees whose produce covers the region's needs. . . [The pool] is surrounded by plants of multiple varieties with evergreen leaves that remain green all year round" (Navarro-Palazón et al. 2013).

In summary, the great *bustān*, the Agdal of Marrakech and its surrounding areas, particularly the agricultural landscape, boasted a wealth of citrus fruits, including lemons and oranges (Navarro-Palazón et al. 2013; Navarro-Palazón et al. 2017; Navarro-Palazón and Garrido 2018; Navarro-Palazón and Puerta 2018), possibly of both sweet and sour varieties, with their fruits likely to have been used as seasoning. It is highly probable that flat lemons, commonly known today as "*limetta de Marrakesh*", were already cultivated, originating from the *taifa* of Murcia, and were among or comprised the lemon trees that bordered the pool. In this sense, they could be interpreted the "delicate lemons" mentioned in 1641 by the Dutchman Adriaen Mathan (Navarro-Palazón et al. 2018). However, determining the relative proportions of the distinct species is not straightforward.

Writing about the structure of the *bustān* to optimize its use and enjoyment, Ibn Luyūn (1282–1349 CE) recommends: "After the zafariche [the space designated for water pitchers], there will be evergreen plants that maintain their freshness. Following this, there will be flowering species, and then the remaining trees. It culminates with grapevines on the sides and trellises (a trellis is a framework or structure, typically made of wood, metal, or latticed materials, which is used to support climbing plants and vines) in the central parts of the

ensemble. And beneath the trellises, there will be pathways (*mamāšī*) encircling the garden area (*al-bustān*) as lateral paths. Among the fruit trees, besides the vines, there will be elms and similar trees, whose wood is useful. Then, there will be white soil (*al-arḍ al-bayḍā'*) to cultivate whatever one wants to be lush. And at the end [of the white soil], trees like the fig tree or others that are not harmful will be planted. And all the major fruit trees should be planted in the northern part (*jawf*) [of the orchard or the white soil] because it is the most suitable. So, they protect from the northern wind and never obstruct the passage of the sun. And in the center of the garden area (*bustān*), there will be a pavilion (*qubba*) for gathering with views in all directions. . . .And adjacent to [the pavilion], rose bushes and myrtles will be planted, as well as anything that beautifies the space of the orchard (*arḍ al-bustān*). . . .The entire orchard (*bustān*) will be surrounded by a high wall to protect and conceal it". (Akef and Almela 2021).

In marginal Note 6. [v. 14], Ibn Luyūn provides a list of plant species optimal for the *bustān*, in which a wide variety of ornamental shrubs, six types of citrus trees (**in bold**), aromatic plants, and flowers are suggested for around the pavilion or leisure area: "There should not be missing in the immediate spaces around the pavilion, or in the leisure area within the orchard (*bustān*), myrtles (*rayḥān*), **bitter orange trees** (*nāranj*), **pummelo or lumia** (*zanbūᶜ*), **lemon trees** (*laymūn*), **bergamot [or pummelo] trees** (*astunbūtī*), **lime trees** (*līm*), **citron trees** (*utrujj*), laurels (*rand*), jasmine plants (*yāsamīn*), plots (*tarābiᶜ*) of borage (*turunjān*), rings (*jawātim*) of lilies (*sūsan*), flowerbeds (*mazāhir*) of violets (*banafsaj*), various types of narcissus (*bahār*), varieties of wallflower (*jayrī*), rose bushes (*ward*), thymes (*nammām*), mint (*naᶜnaᶜ*), rue (*shaḏāb*), elecampane (*rāsin*), marjoram (*marḏanjūš*), chicory (*māmmīṯā*), asparagus (*isfarā*̃), ornamental rose bushes (*ward al-zīna*), colocasia (*qulqāṣ*), and saffron (*za'farān*)". (Akef and Almela 2021).

In the Court of the Water Canal of the Generalife (Granada, Spain), early 14th century CE, the most noble place in the entire estate, the presence of 47 distinct types of pollen was identified in medieval strata through palynological analysis. Among these were myrtle, cypress, three types of citrus trees (bitter orange, lemon, and citron), roses, laurels, and jasmine (Tito-Rojo and Casares-Porcel 2011; Akef and Almela 2021).

Al-Ghazzī in *al-'Āmirī's Khāmi' farā'id al-milāḥa fī Khawāmi' fawā'id al-filāḥa* (circa 1500 CE) enumerates five distinct varieties of citron (Hamarneh 1978). This historical text offers valuable insights into the diverse citron cultivars cultivated in the Western Islamic world and Egypt during the 15th century.

Although it is challenging to estimate the varietal diversity and relative importance of different citrus types in the medieval Western Muslim world, due to the absence of works like those of Ferrari (1646), Volkamer (1708), or the paintings of the Medici collections such as Bartolomeo Bimbi's four major canvases circa 1715, we can approximate their significance by studying the varying presence of different citrus fruits in the treatises of that culture, especially utilizing the synthesis by García-Sánchez et al. (2021). Citrons, lemons, and their hybrids account for 50% of the references, oranges (both sour and sweet) for 28.57%, pummelo and grapefruit for 14.29%, and lumia and pompia for 2.38%. Regarding the importance of hybridization, as will be demonstrated later for Renaissance gardens, primary hybrids predominate (54.76%), supplemented by complex hybrids (4.76%). However, the frequency of basic species (40.48%) is notably higher than in the gardens of Renaissance villas.

2.4.2. Symbolism and Cultural Significance of Citrus in Western Muslim Gardens

In the Patio de los Naranjos of the Mosque Cathedral of Cordoba (Spain), under the orange trees, there is a large cistern. The drain conduit of the cistern appears to have been part of the Islamic *qanāt* system that supplied water to the ablutions room of Hišām I, situated on the eastern side of the Mosque of 'Abd al-Rahmān I. The cistern was replenished with clean water sourced from the Sierra Morena channel (Ortiz-Cordero and Hidalgo-Fernández 2017). Already in the 13th century, it was planted with palm trees, and we know of the existence of orange trees in it since the 15th century. In the 18th century, olive trees

and cypresses were added (Córdoba 2024). Although Barbera (2023) proposes the existence of orange trees in this courtyard since its creation, it is not clear whether the orange trees were planted in this courtyard of religious significance between the 8th and 10th century or later (Figure 9B). The Moorish courtyard of the orange trees, with plenty of orange, lemon and other citrus trees, in the Alcazar de los Reyes Cristianos of Cordoba offers a good example of the persistence of models from al-Andalus in the spaces reformed by the Christians after the reconquest (Figure 9A).

Figure 9. (**A**) The Moorish courtyard of the orange trees, with plenty of orange, lemon and other citrus trees, in the Alcázar de los Reyes Cristianos of Cordoba. (**B**) Patio de los Naranjos of the Mosque Cathedral of Cordoba (Spain). Images by Diego Rivera.

Muslims were well acquainted with the symbolic value of citrus fruits. "The Prophet said: The example of a believer who recites the *Qur'an* is that of a citron which is good in taste and good in smell. And the believer who does not recite the *Qur'an* is like a date which has a good taste but no smell". This *ḥadīth* can be traced to the original source in Al-Bukhari (1992, 2002, 2023), compiled by 846 to 875 CE, one of the most authentic collections of *ḥadīth* in Sunni Islam. It is found in the *Book of Virtues* in the *Qur'an*, *Ḥadīth*

number 5029. The Arabic term used to designate the citrus fruit in the paragraphs is *utruja*, which in the English version is translated as citron (Al-Bukhari 2023) and in the French ones as orange (Al-Bukhari 1992, 2002).

Within literary works, citrus fruits are mentioned in some poems that reflect literary gatherings in gardens or allude to them, where orange or lemon trees are present or serve as a metaphor, including Ibn Ṣāra, al-Aṣamm, Ibn Khafāja, and Ṣafwān b. Idrīs. Some of these poems are titled "The Orange" or "The Orange Tree" and transport us to these moments of literary creation in the gardens of the *almunias*, around a pool, where trees and flowers are reflected. This effect and, in general, that ambiance are the lyrical objects of the poems. Some of these poems can be found in compilations by authors such as al-Maqqarī and al-Kutubī.

The 12th-century poet from Santarém (Portugal), Ibn Ṣāra (García-Gómez 1978), penned this poem about the orange tree (blood oranges): "I see the orange tree (*nāranj*) displaying its fruits, akin to tears tinted red by the torments of love. Carnelian orbs on branches of topaz, in the hands of the zephyr, there are mallets to strike them. At times we kiss them, at others, we smell them, thus, they become either maidens' cheeks or perfume vials".

The poet al-Aṣamm (12th century) was among those who praised the Almohad leader ʿAbd al-Mu'min upon his arrival in al-Andalus. According to García-Gómez (1978), his poetry speaks of an orange (*nāranj*) half of which was red and the other half green; thus, a blood orange akin to the modern "Tarocco" cultivar: "She is a daughter of the forest kissed by the rainbow, whose trace still shines on her sides. She presents to your sight a marvelous spectacle: emerald and pure gold wrought by the rain. On one side, she appears as the bonfire from which Moses, the prophet of God, sought light; on the other, you would say she has been caressed by the hand of al-Jaḍir". Jaḍir (or green) refers to a legendary Sufi figure, of whom there are some references in the *Qur'an*.

The Valencian poet Ibn Khafāja (1986), c. 1100 CE, also describes the orange tree and its fruit using the same techniques as Ibn Ṣāra, that is, metamorphosing the oranges into precious stones. The term used by this author is *nāranŷ*: "How proudly it struts when the rain bestows upon it red jewels and green robes! The clouds' saliva has melted like silver on its branches and solidified into pure gold".

The poet Ṣafwān b. Idrīs of Murcia (12th–13th centuries) describes a young man in a long poem (Al-Kutubī 1974–1975) in which oranges thrown into a pool are used as a metaphor to explain the unrequited love felt by his lovers: "[. . .] A gazelle full of coquetry, that sometimes pleases us and sometimes frightens us. He throws oranges (*nāranj*) into a pool (*birka*), like one that stains chainmail with blood. It's as if he were throwing the hearts of his lovers into the abyss of a sea of tears".

The Algerian historian al-Maqqarī (16th century CE), who compiled the history and literature of the Andalusian Muslims in his work "*Nafḥ al-Ṭībb*", mentions citrus fruits in the context of a meeting of literati (Al-Maqqarī 1968; Del Moral 2009): "One day, Ibn Nizār drank with Abū Jaʿfar ibn Saʿīd and the poet al-Kutandī, in a garden (*janna*) of La Zubia in Granada. In it, there was a pond (*ṣihrīj*) of water surrounded by orange trees (*nāranj*), lemon trees (*laymūn*), and other trees. Above it, there was a water fountain that moved the image of a dancing girl among the jets, and a marble plate that formed the image of a tent in the water conduit". When it was the turn of the poet Kutandī, he said referring to the citrus trees next to the pond: "[. . .] The orange trees (*nāranj*), as their reflection appears under the water, are like damp embers. And the lemons (*laymūn*), without melting, are golden bells moved by the zephyr [. . .]".

There is a curious tree that appears in several images that illustrate the story *Ḥadīth Bayāḍ wa Riyāḍ*, which could be a citrus tree or otherwise, a Moorish myrtle (D'Ottone 2013). Its small, globular fruits positioned apically on the stems surprisingly resemble the citrus fruits depicted on the right side of the scene in the Lamentation of Christ, painted in 1436 by Fra Angelico and preserved in the Museo Nazionale di San Marco in Florence (Barbera 2023). In both cases, they could be exceedingly small oranges or, more likely, "*chinotto*"

oranges (Figures 10 and 11). Based on various historical and artistic comparisons, the dating of the manuscript has been narrowed down to the early 13th century. C. Robinson provides an even more precise estimate, stating, "I believe it is safe to assume that the manuscript was produced sometime between 1175 and 1230 CE". As for its origin, S. Khemir suggests that the manuscript was produced "in one of the leading Almohad cities, most likely Seville" (D'Ottone 2013).

Figure 10. Plants of the gardens illustrated in the *Ḥadīth Bayāḍ wa Riyāḍ*, 12th–13th cent CE, manuscript, Vatican Library 368: (**A**) (4 v.) Cypress, myrtle-like citrus tree and lawn; (**B**) (9 r.) Myrtle-like citrus tree and lawn; (**C**) (10 r.) Myrtle-like citrus tree and lawn; (**D**) (13 r.) Heavily pruned palm tree, lawn, bearded iris, and Arabian jasmine in a pergola; (**E**) (17 r.) Cypress, myrtle-like citrus tree and lawn; (**F**) (19 r.) Cypresses and lawn; (**G**) (26 v.) Myrtle-like citrus tree and lawn. Images by Vaticana (2024).

Figure 11. The plants identified in the illustrations of the *Ḥadīth Bayāḍ wa Riyāḍ*: (**A**) *Cupressus sempervirens*, Kolymbetra Gardens, Valley of the Temples, Agrigento (Sicily, Italy); (**B**) *Phoenix dactylifera* Park of Elche (Spain); (**C**) *Citrus* × *aurantium* L. var. *myrtifolia*; (**D**) *Iris germanica*, Castell del Monte (Puglia, Italy); (**E**) *Myrtus communis* subsp. *baetica*, Molina de Segura (Murcia); (**F**) *Jasminum sambac*, Molina de Segura (Murcia). Images (**A**,**B**,**D**–**G**) by Diego Rivera, (**C**) by Risso and Poiteau (1818–1822).

The plant species depicted in this work clearly held a coded symbolic value that contemporary readers were capable of interpreting. However, the images are realistic enough to allow for tentative identification. The most frequently depicted tree, always situated within the garden walls, is a small-fruited orange tree with leaves resembling those of the Moorish myrtle (*Myrtus communis* subsp. *baetica* Casares and Tito) (Casares et al. 2010). Seven specimens of this orange tree are represented across plates 4v (1), 9r (2),

10r (2), 17r (1), and 26v (1), representing the "chinotto" (*Citrus* x *aurantium* var. *myrtifolia*). Following this, cypress trees (*Cupressus sempervirens* L.) appear, with three depicted across two plates, 17r (1) and 19r (2), also within the garden enclosure. The cypresses boast meticulously manicured crowns trimmed into a lanceolate shape. The units comprising the crown abstractly represent the branches of this tree, laden with green leaves.

Other plants present include the date palm (*Phoenix dactylifera*), depicted on plate 13r (1), recognizable by the remnants of old fronds covering its trunk. In the drawing, the leaves, notably larger than the cypress branches, form a lanceolate crown, suggesting a recently transplanted palm, heavily pruned and with leaves temporarily bound. Its position adjacent to the pool aligns with how palm trees are typically utilized in the Arab world. It is worth noting that young palm trees hold symbolic significance; for instance, in the Punic world, the first coinages of newly founded cities consistently depicted young palms, while subsequent coinages depicted palms of proportionally increasing age (Rivera et al. 2019; Rivera et al. 2023).

The pergola depicted on plate 13r, located beside the pool, appears to host a climbing plant with simple, rounded leaves, indicative of a water-loving species such as Arabian jasmine (*Jasminum sambac* (L.) Aiton), a favorite in Muslim gardens. The lily depicted on the opposite side, also near the pool, is an iris, Iris *germanica* L., though other species cannot be ruled out.

The domestication of irises occurred in the late Middle Ages and during the Renaissance, relying on the intrinsic variability and hybridizations of species from the Eastern Mediterranean (such as *Iris pallida* and *I. variegata*), with the involvement of *I. germanica* and *I. florentina*. This led to the emergence of the first cultivars, which expanded their variability, color range, size, and stiffness of the tepals, as well as their velvety texture, aromas, etc. (Ríos et al. 2024).

The soft, well-manicured lawn, easily traversed barefoot, appears on the seven plates depicting vegetation. Its presence is surprising given the lack of mention in the literature on Islamic gardening. In traditional Islamic gardens, particularly those from the medieval period, the concept of a lawn as commonly understood in Western gardens may not have been prevalent. However, there were some variations in garden design across different regions and time periods within the Islamic world, so it is possible that some gardens may have incorporated grassy areas or patches of lawn, albeit on a smaller scale compared with expansive Western-style lawns. Examples of traditional Islamic gardens that may have included grassy areas or lawns include the Alhambra and the Generalife Gardens in Granada (Spain) (Tito-Rojo and Casares-Porcel 2011), and the Shalimar Gardens in Lahore, Pakistan. However, the extent to which these gardens featured grassy areas would vary, and they may have prioritized other elements of garden design more commonly associated with Islamic gardens. The poem of Ibn al-Zaqqāq, from Valencia, (c. 1100–c. 1135 CE), "Drinking at Dawn", invokes grass and lawn as a place of enjoyment (Reina 2007): "The judge of dawn catches darkness. Wine was served on the wet grass! They look at us with their glasses with bubbles that replace other languid glances. The stars did not go out: they only moved from the sky to the flowerbeds".

The Hall of the Kings, 14th–15th cent CE, is the grand, emblematic space of the Palace of the Lions in the Alhambra complex. The lateral vaults depict sequential scenes from a medieval romance, featuring knights—clearly identified by their Muslim and Christian attire—engaged in various trials to win the favor of a lady. The narrative begins in the left vault and concludes in the right vault, with different episodes such as wild animal hunts, chess games, and knightly jousts (Alhambra Patronato 2024).

Regarding the images of plants from the Vault of the Fountain of the Youth (Granada, Spain), after each plant's identity, between parentheses, is represented the count of repetitions of the same subject: orange tree (*Citrus* × *aurantium*) (5), Pinyon pine (*Pinus pinea*) (2), oleander (*Nerium oleander*) or Moorish myrtle (*Myrtus communis* subsp. *baetica*) (2), cf. climber rose or *Calystegia sepium* (1), and spreading cherry plum (*Prunus cocomilia*) (1) (Figure 12).

Figure 12. Plants illustrated in the *Sala de los Reyes* in the Alhambra, Vault of the Fountain of the Youth (Granada, Spain), 14th–15th cent CE: (**A**–**E**) orange tree (*Citrus* × *aurantium*); (**F**,**G**,**K**) Pinyon pine (*Pinus pinea*); (**H**,**L**) oleander (*Nerium oleander*) or Moorish myrtle (*Myrtus communis* subsp. *baetica*); (**I**) cf. climber rose or *Calystegia sepium*; (**J**,**M**) spreading cherry plum (*Prunus cocomilia*). Images from Simón (2020).

Plants of the Sala de los Reyes, Vault of the Lady Playing Chess are identified here; after the identity, in parentheses, is represented the count of repetitions of the same subject: orange (*Citrus* × *aurantium*) (3), branched tulip (cf. *Tulipa turkestanica*) (2), oleander (*Nerium oleander*) or Moorish myrtle (*Myrtus communis* subsp. *baetica*) (1), blooming tree with heart-shaped leaves, probably a mulberry tree with a climber rose (1), oak tree (cf. *Quercus pyrenaica*) (3), leafless isolated shrub with radiate white flowers (1), Pinyon pine (*Pinus pinea*) (1), and red tulip (cf. *Tulipa sprengeri*) (2). Images from Simón (2020) (Figure 13).

Figure 13. Plants illustrated in the Sala de los Reyes, Vault of the Lady Playing Chess in the Alhambra (Granada, Spain), 14th–15th cent CE: (**A**–**C**) orange tree (*Citrus* × *aurantium*); (**D**,**J**) (lower half), branched tulip (cf. *Tulipa turkestanica*); (**E**). oleander (*Nerium oleander*) or Moorish myrtle (*Myrtus communis* subsp. *baetica*); (**F**) blooming tree with heart-shaped leaves, probably a mulberry with a climber rose; (**G**–**I**) oak tree (cf. *Quercus pyrenaica*); (**J**) isolated shrub, Rosa × *alba*; (**K**) Pinyon pine (*Pinus pinea*); (**L**,**M**) red tulip (cf. *Tulipa sprengeri*). Images from Simón (2020).

2.5. Citrus in Medieval and Renaissance Iberia: The Role in Europe of Christian Gardens

2.5.1. Citrus' Role in the Medieval Gardens of Iberia

The presence of citrus fruits among the elites of Christian Spain was significant since at least the 13th century: in 1268, Jaime I regulated the tithes of the diocese of Valencia. "*De pomis citrinis, albercoquis, limonibus, torongiis, arangiis, cidriis et al.budetis*", no tithe is paid". In 1269, in *La Crónica de Muntaner*, describing the festivities held in Valencia by Jaime I in honor of D. Alfonso de Castilla, it was said that there were "battles of oranges". On

14 May 1287, Alfonso III of Aragon requested the bailiff of Valencia to send him oranges and other fruits to Alcañíz (PARES 2024, ACA. Reg. 71, Fol. 51 v.). In the royal palace of Barcelona, pummelos were grown in 1346 (Gual-Camarena 2024).

The manuscript of the Cantigas de Santa María, written in Galician–Portuguese and set to measured musical notation at the court of King Alfonso X the Wise between 1270 and 1282, is exquisitely illustrated with sequences of six meticulously drawn and colored vignettes by renowned artists. In these illustrations, plants are used to define environments and are often recognizable (Figure 14).

Figure 14. Images of citrus trees in the manuscript "Códice Rico" of the Cantigas de Santa María, written and illustrated at the court of King Alfonso X the Wise between 1270 and 1282. (**A**) cf. orange tree near a fig tree, Fol. 28 V; (**B**) orange tree in the center of the Garden of Eden, with the serpent offering an orange to Eve, Fol. 88 V; (**C**) doubtful orange tree, alternatively a pine tree, Fol. 150 R; (**D**) garden of a cloister, with date palms and orange trees, Fol. 174 R. Images from Patrimonio (2024).

In the "Codex Rico" of the Cantigas, numerous trees, shrubs, and flowers are recognizable. However, their identification in terms of specific species is hindered by the lack of realism in representations. Concerning citrus fruits (Figure 14), only trees bearing

orange fruits could potentially be identified as orange trees, while other types are not observed. Particularly when the image situates the tree in the context of an orchard in a mild climate zone, appearing alongside date palms, which are sensitive to intense frosts, the identification of the image as an orange tree becomes more probable. In open-field contexts, it is possible that other trees, such as the strawberry tree (*Arbutus unedo*), are depicted instead.

On 14 October 1485, 21 *sueldos* were paid for seven sweet orange trees and two mandarin trees, purchased in Valencia and sent to the Alcazar of Seville (Gual-Camarena 2024). In 1492, a shipment of 'sweet orange trees' from Valencia to the court of Seville was recorded (Barbera 2023).

Although rarely cited in commercial documents, citrus fruits imported into Roussillon from Al-Andalus are cited in the tax lists (*leudes*) of Collioure, southern France, in the 13th and 14th centuries (Ruas et al. 2017).

Due to the works by Charles III of Navarre around 1400, the palace of the kings of Navarre in Olite boasted hanging gardens, landscaped areas, orchards, and a zoo with diverse animals including a lion, a camel, parrots, hunting dogs, falcons, African buffaloes, and squirrels. Access to the palace was through the Plaza de Carlos III el Noble. The entrance led to an inner courtyard known as the Patio de los Naranjos, where the king planted orange, lemon, and citron trees and other fruit trees. Today, the floor is paved, but originally, it was a garden with trees and flowers of various species. The care of the gardens required numerous gardeners, and intricate irrigation systems were installed in 1409 by Juan D'Espernou and later in 1414 by John Nelbort of Bristol. During winter, awnings protected the trees attached to the walls, like a greenhouse (Eusko Ikaskuntza 2014; Cátedra de Patrimonio y Arte Navarro 2024). The orange trees in Olite are believed to have been brought from Tortosa.

Based on a story previously recorded by Charton (1857), lore was spread in the Basque media by Gaztelu (1883) and Daranatz (1922) related to citrus fruits and the queens of Navarre. Queen Leonor of Trastamara (1360–1416) personally planted five of these orange trees from the seeds of an orange that she loved, and they survived together, to the extent that three of them came to merge their trunks. Her descendant Catalina I, queen of Navarre between 1483 and 1512, sent orange trees from the Olite garden as a wedding gift to the queen of France, Anne of Britanny, in 1499, and nearly four centuries later, they were still bearing fruit in Versailles until a storm destroyed them before 1883 (Gaztelu 1883), although the most singular orange tree, which received the name of "Le Grand Connétable", "le François Premier", or "le Grand Bourbon" (Figure 15), survived until 1894 (Daranatz 1922).

However, there seem to be other possibilities for the introduction of orange trees in France. The manor of Château Gaillard, located near the castle of Amboise, is famous for having belonged to Pacello da Mercogliano (ca 1453–1534), a gardener and hydraulic engineer brought to the Court of France by Charles VIII in 1495, then serving kings Louis XII and François I. This place "was charged, among other obligations, with a bouquet of oranges to the king for his barony of Amboise", a particularly rare and poetic feudal duty, evoking the cultivation of orange trees that Pacello da Mercogliano would have introduced to Château Gaillard in a south-facing and sheltered site, much more conducive to their culture than the windy heights of the castle of Amboise located just above. Louis XII would provide the "place, land, garden, and belongings of Chasteau Gaillard to *messire* Passolo de Meriolano [sic], in return for thirty *solz* of rent", by letters patent of May 1505, in gratitude for the services rendered and undoubtedly to facilitate the acclimatization of the precious citrus intended for his gardens in Amboise and later, in Blois. The formulation of the bouquet of oranges leaves open questions of whether it refers to flowers or fruits in the first case, and bitter oranges or sweet oranges in the second case, the latter being a species more recently introduced to Europe (Pinon 2018).

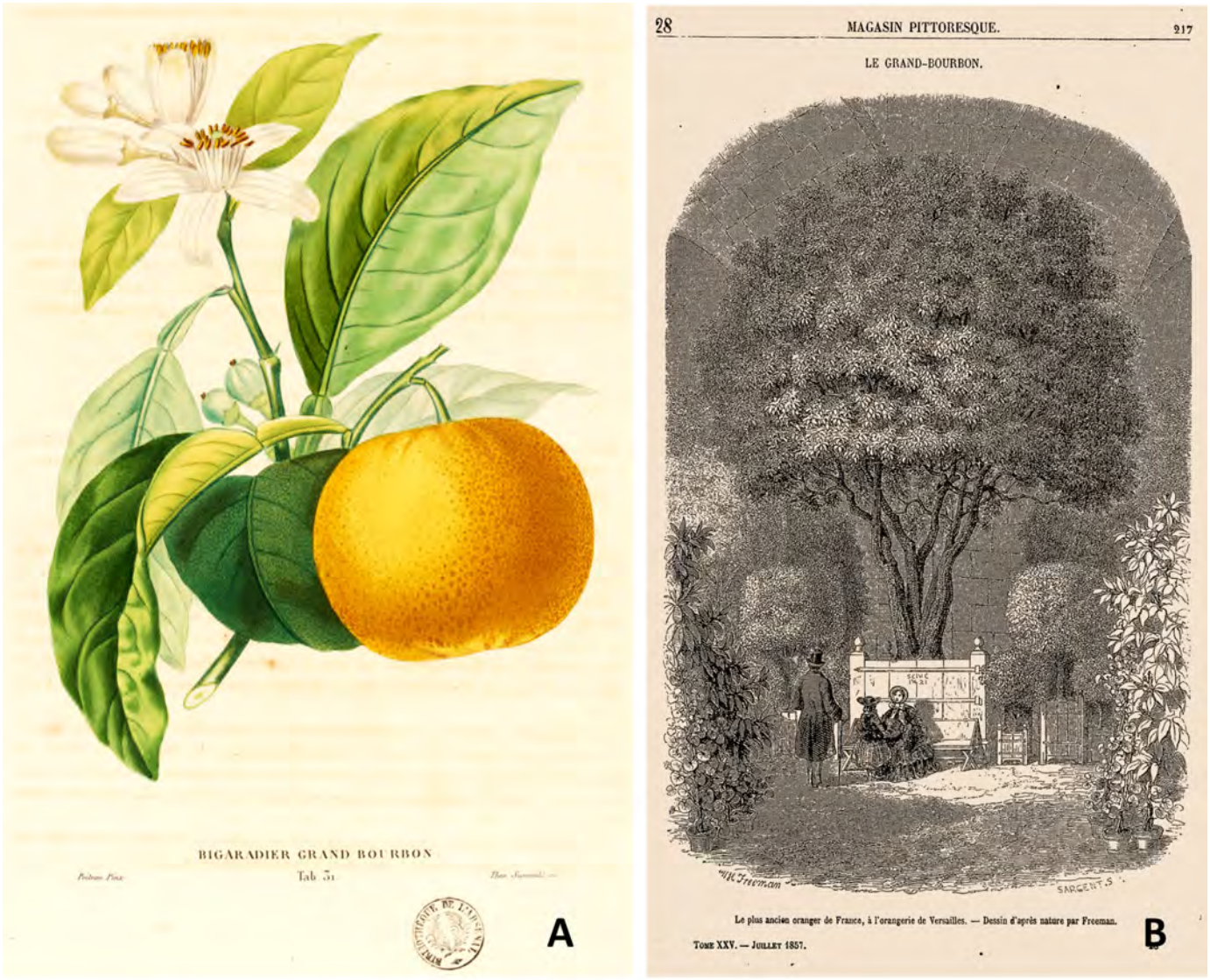

Figure 15. The "Grand Bourbon" orange tree: (**A**) fruit and flowers of the "Grand Bourbon" orange tree in 1819 at the Versailles orangery, with an age of c. 400 years; (**B**) the "Grand Bourbon" orange tree in 1857 at the Versailles orangery, with an age of c. 430 years. Images: (**A**) by Risso and Poiteau (1818–1822), (**B**) by Freeman in Charton (1857).

Archival evidence from 15th-century Portuguese notarial records demonstrates the economic significance of *Citrus aurantium* L. in urban property transactions. Documentation from Évora (1435–1436) reveals multiple instances of rental agreements specifically citing orange-bearing parcels, including a notable property with irrigation infrastructure. This pattern extended to northern Portugal, as evidenced by a 1497 contract detailing a mixed-cultivation parcel containing *C. aurantium* alongside *Ficus carica* and other fruit-bearing specimens. These notarial records illuminate the role of citrus cultivation in determining urban property values during the late medieval period (Rodrigues 2017).

2.5.2. Citrus Use in the Renaissance Gardens of Iberia

In 1490, King João II of Portugal commissioned an orange grove at his palace in Évora, southern Portugal. This garden would become the renowned 'King's Orange Grove', which German traveler Hieronymus Münzer documented in his 1494 visit. The grove was thoughtfully designed, with orange trees protected by an encircling hedge of reeds (Rodrigues 2017).

In the early 16th century, citrus varieties (lime, sour limetta, lemon, citron, pummelo, and orange, among others) were well established in Spain, not only in the warmer places. This led Gabriel Alonso de Herrera (1513) to write: "The orange trees, along with these other trees in their company, are very graceful trees, with their green leaves, the scent of their flowers, the sight, and the benefit of their fruit, very pleasant and beneficial. They are such that one cannot say it is a perfect garden where there are none of these trees, especially orange trees". Citrus fruits with sour juice became so common (Rivera et al. 2022) that they were used in the preservation of olives, as evidenced in the text by Gabriel Alonso de Herrera (1513): "Launder the olives well and place them in that brine in a small jar, and add finely chopped limes there and squeeze their sourness there and add bay leaves and citron or orange or lemon leaves and branches of rue and olive or wild olive leaves, and some anise and fennel seeds, this is the best marinade, and the broth is worth almost as much as the olives, and in the absence of limes, good white vinegar can be added". Gregorio de los Ríos's *Agricultura de Jardines* was first published in 1592, and the version of 1620 is associated with Alonso de Herrera's work. Their books had a major impact not only in Spain but also in Portugal (De los Ríos 1592, 1620; Fernández and González 1991; Rodrigues 2017). De los Ríos' treatise provides extensive guidance on the propagation and cultivation techniques for orange trees, as documented across folios 79 verso through 101 verso in the 1592 edition. Furthermore, the text considers other related citrus species, including citrons, lemons, limes, and limettas.

The level of detail provided by de los Ríos on orange tree husbandry practices suggests a sophisticated understanding of citrus arboriculture during this historical period. The inclusion of multiple allied citrus taxa indicates a broader examination of the cultivation requirements and uses for this economically important genus within the work.

The comprehensive treatment of orange tree propagation methods as well as the documentation of peripheral citrus crop types underscores the treatise's significance as a valuable primary source for scholars investigating the development of horticultural knowledge and citrus industries during the late 16th century.

Financial records from 1520 and 1521 reveal the purchase of mature orange trees for the Monastery of Saint Claire in Estremoz, Portugal. While these initial acquisitions were modest, with only a few trees planted in each garden, they would prove to be harbingers of change—these early plantings would eventually transform the local landscape as orange cultivation spread throughout the region (Rodrigues 2017).

Topiary reached remarkable artistic heights in Valencia (Spain) in the 16th century CE, at the Villa of Huerto del Patriarca, owned by Bishop San Juan de Ribera, where intricately woven walls of orange trees stood alongside canals of clear water that traversed the garden (Campos-Perales 2018; Barbera 2023).

In the late 16th century, Father José Sigüenza (Sánchez 1881) described the core gardens at the Monastery and Royal Site of El Escorial adorned with citrus trees: "Above this terrace, 100 feet wide, lies a square filled with gardens and fountains, reminiscent of the legendary Hanging Gardens of Babylon. Countless varieties of plants, shrubs, and herbs adorn this space, offering an abundance of flowers year-round. Bouquets of remarkable freshness and beauty are effortlessly composed, with many carnations and cloves flourishing even in the harshest winter. These gardens boast twelve meticulously placed fountains, each surrounded by beds of flowers in various hues, resembling fine carpets from distant lands. Along the walls, lattice works support roses, privets, jasmine, honeysuckles, and, surprisingly, orange and lemon trees. Despite the chilly winds, we delight in their blossoms and fruits. These gardens are a source of joy for all who visit, whether strolling among the blooms in summer or basking in the winter sun" (Sánchez 1881; Luengo 2024).

Cascales (1874) provides a detailed account of the gardens and orchards of the Monastery of San Gines de la Jara in Cartagena, at the close of the 16th century. He describes, "On one side of this courtyard lies a spacious, lengthy expanse, adorned with two fountains that irrigate large and flourishing cinnamon trees, youthful pines, orange trees, and mulberry trees". Continuing after the depiction of the church, he adds, "This

estate boasts a garden, deemed one of the most illustrious in Spain. At its inception, two abundant springs converge, filling a large basin: from here, channels branch out along various paths, nourishing every part of it, thereby bathing the fertile soil frequently and engendering the immense fertility of trees, herbs, and flowers." The profusion of plants is indeed remarkable, yet it is the order and arrangement of all that astonishes the mind, enhancing and magnifying the delight sought and embraced by the sight. Here, there are avenues lined with orange, lemon, lime, citron, and poncile trees, whose fragrant blossoms are intoxicating, whose greenery is resplendent, and whose allure is perpetual; vineyards, whose leafy tendrils delight the eye, whose sour and ripened grapes tantalize the palate; fruit trees, pomegranates, service trees, pear trees, apple trees, fig trees, numerous and yielding excellent fruit; almond trees, whose blossoms foreshadow a bountiful harvest in all seasons; olive trees, which furnish the oil, the principal sustenance of human life; wise mulberry trees, triumphant laurels, verdant myrtles, towering palm trees laden with their tough fruit, lofty cypress trees emulating Egyptian pyramids or Roman milestones, glorious cinnamon trees, and rare terebinths; holm oaks brimming with the original sustenance, which ingenious Ceres transformed into fine wheat; humble mastic trees and fragrant elder trees, among them various flowers scattered along the margins, delighting with their verdure and captivating with their scents. And the tall trees that rise above the smaller ones resemble another suspended garden in the air, akin to the artful tomb of Mausolus.

That citrus cultivation was well established in Spain is shown in this fragment of a poem by Lope de Vega-Carpio (1602): "…should be planted in April; and in March the orange and lime, and the esteemed zamboa, the warty citron…".

Gregorio de los Ríos's *Agricultura de Jardines* (in the version of 1620) provides limited documentation of citrus diversity and cultivation practices, a constraint potentially attributable to the work's concise nature, the climatic restrictions of Castilian environments, or possibly, the royal court gardeners' limited exposure to Spain's peripheral citrus diversity present in regions such as Murcia, Valencia, Sevilla, and the northern coastal areas of Asturias and Cantabria. Nevertheless, the treatise dedicates five pages to essential citriculture practices, including propagation methods for *Citrus aurantium*, transplantation techniques, grafting procedures, and irrigation protocols. Due to their perfume and color, orange trees were eligible for consideration as an ornamental plant and could thus be included in gardens. Of scholarly interest are the author's novel instructions regarding the preparation of drinking vessels fashioned from bisected and hollowed specimens of *C. limon* and *C. medica*, representing an early documentation of citrus fruit utilization beyond conventional horticultural applications (De los Ríos 1620; Fernández and González 1991; Rodrigues 2017).

The historical relationship between the theory and practice of citrus irrigation in Iberia and Sicily has been examined by Professor Ana Duarte Rodrigues (2023). Her research compares the agricultural treatises of Alonso de Herrera (1513) and De los Ríos (1592) with the firsthand account from Antonino Venuto (1516) describing the Sicilian context. Rodrigues' analysis reveals a notable disconnect between the idealized irrigation methods promoted in theoretical agricultural manuals and the actual water management systems employed by early modern citrus growers. Contrary to the prescriptive recommendations of theorists, diverse, context-specific irrigation techniques and hydraulic structures were widely adopted, even in arid regions, to facilitate citrus cultivation. This divergence between theory and praxis highlights the complex realities faced by premodern citrus cultivators, who developed innovative water-saving strategies to overcome local environmental challenges. Venuto's account of the Sicilian context provides valuable insights into these pragmatic adaptations, which often differed from the idealized methods proposed in influential agricultural treatises.

Thomas Cox, in his comprehensive account *A General Description of the Kingdom of Portugal* of 1701, documents Portuguese garden composition, noting the predominance of citrus species—particularly *Citrus aurantium* L. and *C. limon* (L.) Osbeck—alongside various fruit-bearing specimens and aromatic culinary flora, reflecting the period's integration of

ornamental and utilitarian horticulture. However, Cox criticized the fact that orange tree groves in Portuguese gardens were not lined up (Rodrigues 2017).

2.6. Norman Gardens of Sicily: The Role of Citrus

2.6.1. Citrus Cultivation in Norman Gardens of Sicily

The Norman dynasty of Sicily was distinctive in its assimilation of local practices and structures, drawing extensively from both Islamic and Byzantine traditions.

While the existence of citrus fruits in Islamic Sicily prior to the Norman conquest is plausible, we lack evidence until the 11th century, when a notarial deed from 1094 mentions a road called "*de arangeriis*" in Patti, between Palermo and Messina, and in 1095, a boundary "*de limonis*" is documented (Barbera 2023).

In the 12th century, the Norman monarchs surrounded Palermo with parks, which were images of strength and dominion over nature, bent on the satisfaction of pleasure and luxury and demonstrations of a power that was also based on the appropriation of the landscape and lifestyle that were part of the culture of the subjugated Arabs who, for almost two and a half centuries, had dominated Sicily. The first of these was Maredolce–La Favara, created at the behest of Roger II in the years between 1130 and 1150, on pre-existing Arab and, before that, Roman sites. Within the palace complex of Favara–Maredolce, as described by the poet Abd al-Rahman, in the 12th century, there existed at the center of the artificial lake an island filled with magnificent orange trees. Abd ar-Rahman al-Itrabānishi, an Arab poet from Trapani, during the reign of Roger II (12th century CE), wrote in his poem about the "Favara with the twin lakes" (Bellanca 2015):

"The proud orange trees on the small island seem like flames burning on emerald branches. The lemon tree appears pale, like a lover who has spent the night in sorrow, tormented by the anguish of distance. . .".

In this poetic imagery, the citrus trees—orange and lemon—take on symbolic roles that transcend their physical beauty. The vibrant oranges, burning like flames on emerald branches, evoke vitality, passion, and the intensity of life. In contrast, the pale lemon tree, likened to a lover consumed by the anguish of separation, represents melancholy and longing. Through this powerful symbolism, al-Itrabànishi connects the natural world with the emotional depths of human experience, using the citrus trees as metaphors for love, desire, and sorrow.

The Favara today retains the characteristics of a medieval Islamic landscape. In front of the palace, much of it already recovered, the lake basin is shown in its boundaries and many building elements are still intact. On the island, also clearly discernible, an old citrus grove hints at a use that is also essentially unchanged, although date palms, bitter oranges, and lemons have been replaced by mandarins (Barbera et al. 2015; Barbera and Speciale 2015; Barbera 2023). Even the grand pavilion of *La Cuba* recalls the past splendors of an orange grove that in 1335 was the subject of a disastrous sack (Barbera 2007, 2023).

Hugh Falcando in the late 1100s left, in an epistle mourning the death of William II, a description of the land surrounding Palermo: "bountiful plain, worthy of exaltation, at all times, enclosing in its bosom every species of trees and fruit, which alone offers all the delights present in every place, with the enchantments of its florid landscape captivates to such a degree that, whoever had the good fortune to see it once, can hardly, by any flattery, ever detach himself from it". There, citrus, oranges in particular, played a pivotal role, serving as symbols of prestige and luxury (Barbera and Speciale 2015; Barbera 2023).

Pietro da Eboli (circa 1150–circa 1220 CE) was an Italian poet, chronicler, and cleric associated with the Swabian court. Loyal to the policies of Henry VI, he dedicated the *Liber ad honorem Augusti* (also known as *Carmen de Rebus Siculis or Carmen de motibus Siculis*) to him.

That work celebrates Henry VI's descent into Italy and his victorious war against Tancred, Count of Lecce, culminating in the conquest of Sicily in 1194. Comprising 837 couplets, the text is divided into three books with 51 sections. The first two books narrate Henry IV's expeditions against the Normans, while the third exalts the emperor's personality and his

governance of the royal palace in Palermo. The esteemed illuminated manuscript (Burgerbibliothek of Bern, ms. 120 II), with its miniatures and autograph corrections indicating meticulous attention, was intended as a gift to the emperor, though it is uncertain if it was ever presented. In the "*Particula III, Lamentatio et luctus Panormi*" the poem continues: "Thus far, our minds were free from wolfish fears, to fold they came, unbidden, with the night, heavy with milk, the shepherd's sheep returned. Thus far, the ox, with cloven hoof, feared not the prowling lion, nor did birds dread the taloned eagle's fierce and sharp-edged beak. Thus far, the solitary traveler walked, rejoicing, through the shadowed paths alone. . ."

The associated illustration represents the "*Genoardi viridarium*", the Genoardo's *bustān* or park, with trees and the birds, eagle, and wolf of the poem (Masseti 2009). Among the plants are easily recognizable, in the lower left corner, grapevine (*Vitis vinifera*) and in the lower right corner, a fruiting date palm (*Phoenix dactylifera*). Above the former are two stems of sugarcane (*Saccharum officinarum*), although common reed (*Arundo donax*) should not be discarded as a possibility. To the right of the grapevine, there is an oleander (*Nerium oleander*) bush, and close to it is a citrus tree without fruits. Positioned above the palm is a cypress with an oval lanceolate crown, some of its branches spreading beyond the regular limit of the crown (*Cupressus sempervirens*) (Figure 16).

Figure 16. Plants of the Norman Gardens (Sicily, Italy), 12th–13th cent CE. Genoardo's park, Palermo: (**A**) two stems of sugarcane (*Saccharum officinarum*); (**B**) grapevine (*Vitis vinifera*); (**C**) oleander (*Nerium oleander*) bush; (**D**) citrus tree without fruits; (**E**) fruiting date palm (*Phoenix dactylifera*); (**F**) cypress with an oval lanceolate crown, some of its branches spreading beyond the regular limit of the crown (*Cupressus sempervirens*). Image from Delle Donne (2024).

2.6.2. Influence of Norman Rulers on Citrus Cultivation and Symbolism

The reasons behind the Norman monarchs' decision to surround Palermo with parks and gardens mirror those seen in all medieval Islamic capitals: the understanding of the powerful image and dominance derived from nature when it is harnessed for pleasure and luxury. This stands in contrast to the bare and arid landscape, serving as a demonstration of the authority of the new power, which also rests on the appropriation of a landscape and lifestyle that are part of the culture of the subdued Arabs. The "Parco Vecchio" of Favara and Genoard still stand today as unambiguous evidence of this (Barbera 2007).

The Zisa palace stood within the vast Norman hunting park and was used only for brief stays. It evoked the concept of a solatium or pleasure pavilion, surrounded by lush nature with fruit trees and palm groves, watercourses, and ponds. The presence of iconographic motifs inspired by hunting and nature, both in the mosaic-covered walls and column capitals, suggests that this environment was an ideal extension of the garden within the palace (Racioppi 2024a) (Figure 17).

Figure 17. Images of plants in the Norman Palaces (Sicily, Italy), 12th–13th cent CE. Zisa palace, Palermo: Citrus tree flanked by two date palms (*Phoenix dactylifera*). Image: https://commons.wikimedia.org/wiki/File:Mosa%C3%AFque_de_la_Zisa_(Palerme)_(7035275791).jpg, accessed on 13 November 2024.

The Roger II Hall in the Royal Palace (or Norman Palace) (Palermo, Sicily, Italy), rectangular in plan and covered by a cross-vault, features a rich mosaic decoration above a high marble base, dating to the regency period of William I (circa 1170). Mosaics adorn the walls, lunettes, arches, and vaults. Leopards, lions, deer, peacocks, centaurs, and archers face each other symmetrically among fruit trees and palms (Figure 18) (Racioppi 2024b).

The fruit trees and the water—in large basins, pools, canals, and fountains—as the main element of symmetry, together with the peri-urban location near a palace, enclosed by walls, the presence of pavilions, its panoramic position, the formal design of at least some of the spaces, and the proximity to hunting areas, confirm Norman amusements (solacium is a term first used by Falcando) as belonging to the Islamic cultural universe (Barbera 2007).

The citrus fruits initially spread in the royal gardens, and the words of Sicilian poets in Arabic remain unmatched in expressing their assigned value; for Abd al- Raḥmān, "the lemon seems to have the pallor of a lover who has spent the night lamenting the anguish of distance", and Abu-l-Hasan Alī describes the orange as follows: "Come, rejoice in your gathered orange: happiness is present when it is present./Let the cheeks of the branches be welcomed and let the stars of the trees be welcomed!/It seems as if the sky has poured out golden dust and the earth has formed it into shining spheres" (Barbera 2007).

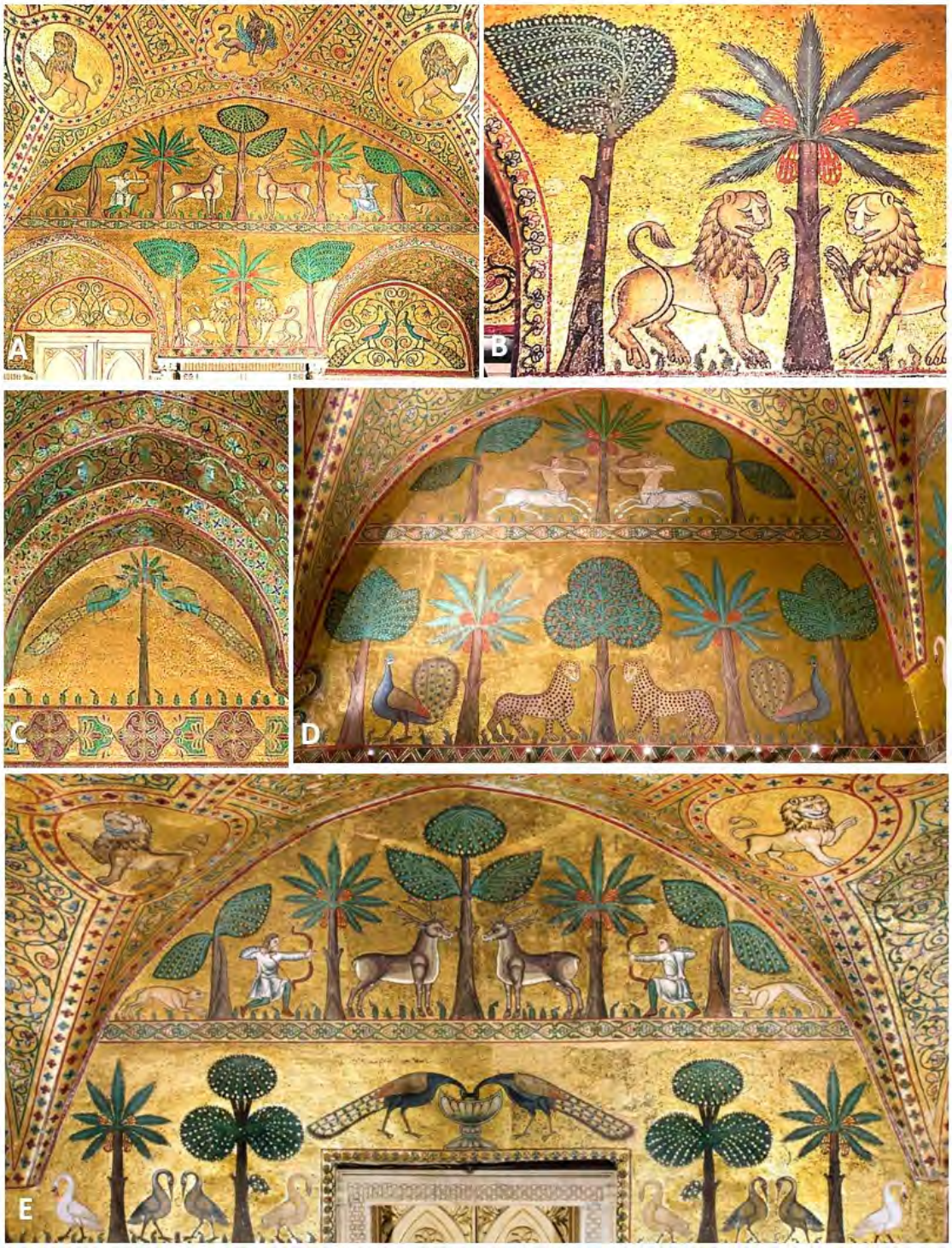

Figure 18. Images of Plants in the Norman Palaces (Sicily, Italy), 12th–13th cent CE. Chambers of Roger II, Royal palace, Palermo: (**A**) above, citrus trees and date palm trees. Below, date palm tree (*Phoenix dactylifera*) flanked by two lions and two citrus trees; (**B**) detail of date palm and olive tree; (**C**) old, tall date palm; (**D**) above, date palm flanked by centaurs and citrus trees. Below, fig tree flanked by leopards, date palms, citrus trees, and peacocks; (**E**) above, citrus trees and date palm trees. Below, olive trees and date palms. Images: (**A**,**C**,**E**) https://islamicart.museumwnf.org/database_item.php?id=monument;ISL;it;Mon01;17;it; (**B**) https://www.bbpalermo.it/wp-content/uploads/2016/12/Joharia-Sala-di-Ruggero-parete-occidentale-1.jpg, accessed on 13 November 2024; (**D**) https://www.esplora.co.uk/wp-content/uploads/2023/04/IMG_9701-scaled.jpeg, accessed on 13 November 2024.

2.7. Renaissance Peri-Urban Villae: Citrus Collections and Elite Culture

2.7.1. Emergence of Peri-Urban *Villae* During the Renaissance

During the Renaissance, peri-urban villas became focal points for citrus cultivation, attracting the attention of elite families like the Barberini, Medici, and Orsini, who amassed citrus collections for exclusive enjoyment. Some of these citrus fruits were sought after for being aberrant, anomalous, and therefore, rarer (Figure 19).

Figure 19. Fruits of singular citrus varieties from historical Italian Renaissance collections: (**A**) lumia, Oscar Tintori; (**B**) limone incanellato, Boboli; (**C**) limone della Procida, Boboli; (**D**) limone cedrato, Giardino Botanico Firenze; (**E**) limone—medica Fiorentina, Giardino Botanico Firenze; (**F**) cedro di Roma, Oscar Tintori; (**G**) limetta, Oscar Tintori; (**H**). peretta di S. Domenico, Oscar Tintori; (**I**). bergamotto feminello, Giardino Botanico Firenze; (**J**) limoncello di Spagna, Oscar Tintori; (**K**) Arancia cornicolata, Giardino Botanico Firenze; (**L**). Arancia canalicolata, Oscar Tintori. Images by Concepción Obón and Diego Rivera.

Renaissance villas were characterized by their integration of architecture, gardens, and surrounding landscapes into cohesive, harmonious ensembles, often featuring symmetrical layouts, formal gardens with geometric designs where "*ars topiaria*" played a relevant role, terraces, water features, and meticulously cultivated orchards, reflecting a fusion of artistic, architectural, and horticultural ideals emblematic of the Renaissance period.

In the Third Day of the *Decameron*, written by Boccaccio in 1350, he describes one of these gardens: "They opened a garden adjacent to the palace, surrounded by walls; upon entering, they found it to be of marvelous beauty… Amid it was a lawn of the tiniest grass, so green that it almost appeared black, painted with perhaps a thousand varieties of flowers, enclosed by vibrant green and living orange and citron trees. These trees, bearing both old and new fruits and flowers, not only delighted the eyes with their shade but also pleased the sense of smell" (Rigg 1930; Barbera 2023).

Tapestries with garden-like surroundings, known as "mille fleurs", produced in Flanders and France in the late 15th century CE, provide significant information about the ornamental flora of that era. Of relevance is the set of six tapestries known as "The Lady and the Unicorn", which is preserved in the Cluny Museum (National Museum of the Middle Ages, Paris, France) (Taburet-Delahaye and de Chancel-Bardelot 2018). These tapestries, designed in Paris in the late 15th century CE, are dedicated to the theme of the five senses and desire. In addition to numerous herbaceous species, roses appear in two of the tapestries, and four trees are repeated throughout: stone pine, holly, oak, and orange. The orange tree is depicted with both fruits and flowers on the same tree, indicating the preservation of the fruits beyond the normal harvest date, which precedes the next flowering (Figure 20B–F). This highlights its ornamental rather than productive nature, as it was common in Andalusian gardens and noted by Ibn al-ʿAwwām, c. 1150 CE. It is highly likely that the depicted trees are bitter oranges (*Citrus aurantium* L. var. *aurantium*).

Concerning the patterns of association of themes and figures in "The Lady and the Unicorn" set of tapestries, in the tapestry of "Desire", the only tapestry not associated with one of the five senses, the unicorn is depicted close to an orange tree. In the tapestry dedicated to "Hearing", the unicorn is shown free and associated with orange trees. In the two tapestries dedicated to "Touch" and "Smell", orange trees are represented in groups of three and associated with a heraldic lion. The lion also appears in the tapestry dedicated to "Taste", where it is associated with a solitary orange tree with a very tall and slender trunk. Finally, the tapestry dedicated to "Sight" features only two trees, holly and oak, thus omitting the orange and pine trees that appear in the others. The associations in the tapestries can be organized into three types:

1. Orange Trees and Unicorns (Figure 20B,D):

Desire and Hearing: The unicorn is linked to a group of orange trees, which could symbolize the connection between purity (unicorn) and the exotic (orange tree), indicating a more harmonious and liberated state;

2. Orange Trees and Lions (Figure 20C,E,F):

Touch and Smell: Groups of three orange trees are associated with a heraldic lion, potentially symbolizing strength, protection, and the sensory richness of the environment;

Taste: A solitary orange tree with a tall, slender trunk is associated with the lion, emphasizing the singularity and refinement of taste;

3. Exclusion from in the Tapestry of Sight:

The tapestry dedicated to "Sight" excludes the orange and Pinyon pine trees, featuring only holly and oak. This might suggest a focus on different symbolic meanings associated with vision, such as resilience (holly) and strength or endurance (oak), rather than the more exotic or sensory associations of the other trees.

These patterns of association could reflect the symbolic meanings attributed to the unicorns, lions, and specific trees within the context of the senses and the thematic elements of the tapestries.

The set of "Four Tapestries" made in Paris at the beginning of the 16th century CE and preserved in the Cluny Museum belongs to the "*mille fleurs*" style. One of these tapestries features an orange tree with fruits and white-colored flowers (Figure 20A).

Figure 20. Citrus in the late 15th century CE "mille fleurs" tapestries of the Cluny Museum (Paris): (**A**) set of the "Four Tapestries", orange tree with flowers and fruits. In the next set of "The Lady and the Unicorn", the scenes are placed in the framework of a garden with four trees and hundreds of herbaceous flowers; (**B**) orange tree with blossoms and fruits in the Desire tapestry; (**C**) blossoming orange trees with fruits in the "sense of Touch" tapestry; (**D**) similar trees in the "sense of Hearing" tapestry; (**E**) similar trees in the "sense of Smell" tapestry; (**F**) one single tall orange tree in the "sense of Taste" tapestry. Images by Diego Rivera.

2.7.2. Citrus Diversity and Role in the Renaissance Gardens

During the Renaissance period, scholarly documentation of *Citrus* species exhibited a gradual yet limited progression, characterized initially by sparse and fragmented accounts with minimal iconographic representation in naturalist, medical, and pharmaceutical treatises (Baldassarri 2022). The publication of Ferrari's (1646) *Hesperides* and Volkamer's (1708) *Nürnbergische Hesperides* marked a significant epistemological shift in citrus scholarship, providing comprehensive taxonomic descriptions and detailed botanical illustrations that advanced the understanding of citrus diversity.

However, given their geographical focus on Italian and German collections, respectively, these seminal works captured only a portion of the Mediterranean's citrus diversity. Notable omissions included distinctive cultivars from Portugal, various regions of Spain, Greece, the Levant, and North Africa, leaving significant gaps in the documented botanical heritage of these peripheral regions.

Among the four basic species from which all Mediterranean citruses descend (*C. medica*, *C. maxima*, *C. reticulata*, and *C. hystrix*) (Curk et al. 2022; Rivera et al. 2022), only one, *C. medica*, appears to have been cultivated in the Mediterranean for over two millennia. The introduction of *C. maxima* could date back to the Middle Ages, while the other two (*C. hystrix* and *C. reticulata*) arrived during the 19th century. It is crucial to emphasize here that between 75% and 90% of the diversity in Renaissance citrus gardens stemmed from various hybrids that were present in much higher proportion than in the Western Muslim gardens. Oranges, lemons, limes, mandarins, and limettas are of hybrid origin and were introduced at various times from Asia, already hybridized at their source, with lemons having been in the region for over two millennia.

Hybridization has played a crucial role in the development of diversity in Mediterranean citrus gardens since their inception, a concept first proposed by Nicolas Monardes in the 16th century CE (Monardes 1551; Baldassarri 2022). In addition to this, locally originated hybrids in the Mediterranean emerged because of cultivating diverse citrus varieties together. Such hybrids include lemon–citron hybrids (*C.* × *limonimedica*) (Figure 19), true lumias (*C.* × *lumia*) (Figures 19 and 21), which are hybrids of citron and pummelo, hybrids of orange and citron known as "pompia" (Figure 21), mellarosa limes (*C.* × *mellarosa*), bergamots (*C.* × *bergamia*), and although presumed to have originated in America, grapefruits (*C.* × *aurantium* var. *paradisii*), which appear to stem from a hybridization between orange and pummelo that may have also occurred in the Mediterranean. Moving into the 19th century, it is worth noting that clementines originated in Algeria because of hybridization between sweet mandarin and sweet orange (Curk et al. 2022).

Lemon and citron, along with their hybrids known as citron–lemon, accounted for between 50 and 70% of the citrus diversity in Renaissance gardens (Ferrari 1646; Volkamer 1708; Baldini and Sacaramuzzi 1982). Oranges (sweet, sour, acidless, blood, or chinotto) were sufficient to account for 23.29% of the citrus diversity in the Barberini collections (Ferrari 1646), 29.41% of the Nuremberg gardens (Volkamer 1708), and 20.35% of the Medici collections in Florence (Baldini and Sacaramuzzi 1982).

The "lumias" are a unique case, as they are citrus fruits long recognized as of hybrid or mixed origin (Raimondo et al. 2015). This category includes hybrids of citron and pummelo or citron and orange, such as "pompia" (Curk et al. 2022) and others, and is linked to citrus "peretas" (Figure 21B) and "Adam's apples". Due to the rarity of their forms, they were attractive to Renaissance collectors, and although they are nowadays found only in specialized nurseries (Tintori 2024), they constituted a significant portion of collections at that time: 10.96% in the Barberini collections (Ferrari 1646), 7.35% in Nuremberg (Volkamer 1708), and 8.85% in the Medici collections in Florence (Baldini and Sacaramuzzi 1982).

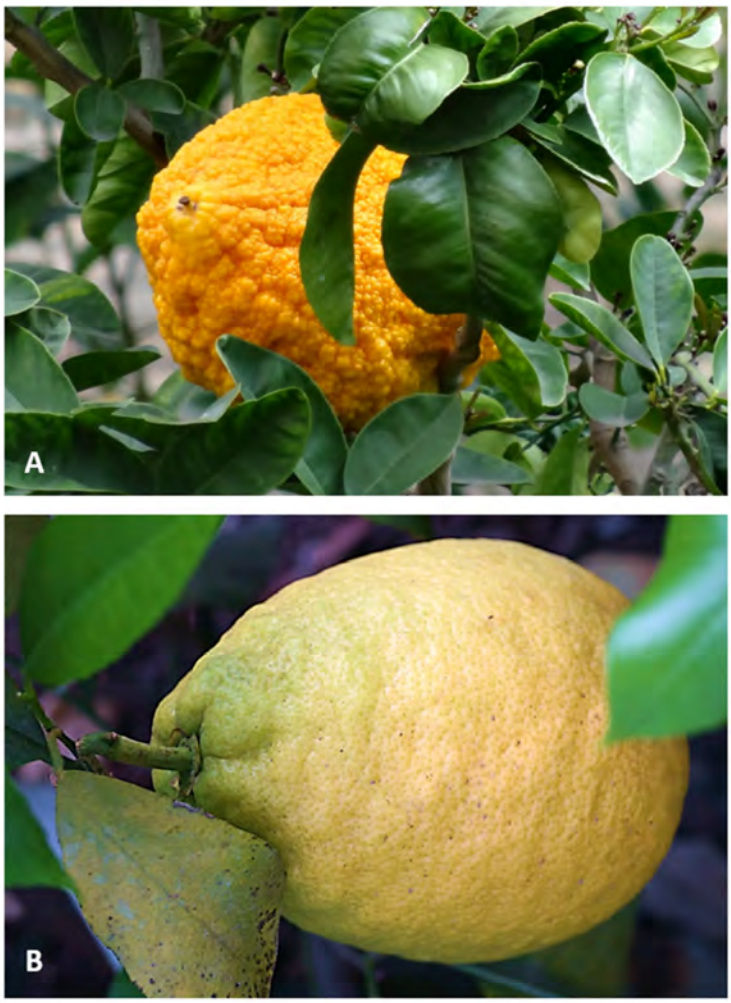

Figure 21. Hybrids of citron: (**A**) pompia (hybrid of *C. medica* × *C.* × *aurantium*) from the Farnesina Palace (Rome, Italy), also known as *C. medica* "Aurantiata" or "cedro della Cina"; (**B**) lumia pyriforme (hybrid of *C. medica* × *C. maxima*), Oscar Tintori greenhouses. Images by Diego Rivera and Concepción Obón.

Pummelos and limes were merely vestigial, with prevalence below 5% (Ferrari 1646; Volkamer 1708), while mandarins, clementines, or combavas made their entry much later in the history of Mediterranean gardens (Gallesio 1840; Savastano 1883; Giner-Aliño 1893; Rivera et al. 1998; Trisciuzzi 2009; Biscotti 2016; Tintori 2024).

In places not suitable for citrus cultivation, these were replaced by their representation. We should not be surprised to see sculptures of orange and lemon trees on the main building of Jacques Coeur's palace, Bourges, from around 1450; a feature which strongly expressed the prosperous business that was developing with eastern countries (Ruas et al. 2017).

In the mid-15th century, the Villa Medicea di Careggi, owned by Cosimo de Medici, boasted various citrus trees in its gardens, among collections of rarities and wonders of nature. This passion for collecting would continue among his successors, such as Francisco I or Cosimo II and III, within the context of the various Medici villas, especially in the extensive gardens of Boboli in the Oltrarno district of Florence (Barbera 2023; Pavesi 2023) and the villa of Castello, which, during the time of Cosimo III, was transformed into a place filled with all sorts of fruit trees, citrus, grapes, and flowers that could be found at the time, both natural and extravagant and bizarre aberrations of nature. For this reason, there was never any exotic or unusual fruit that His Highness did not immediately have the painter Bimbi portray (Barbera 2023; Pavesi 2023).

Analysis of the history of citrus names in the various languages of the western Mediterranean (Table 1) is complicated by the unequal quality of available translations, especially those of medieval Western Muslim agronomists, which lack detailed accompanying images for clarification. Nevertheless, it provides an especially useful tool for tracing the transit of varied species from the world of the *bustān* or Almunia to that of Renaissance villas and the great collections with their hundreds of large pots in terracotta (Figure 22A,B) and costly orangeries (Figure 22C).

Figure 22. (**A**) Orange tree growing in a large terracotta pot in the garden of the Farnesina Palace (Rome, Italy). (**B**) Buddha's hand tree in a large terracotta pot in the garden of the Villa Borghese (Rome, Italy). This form of cultivation was widely used in Renaissance villas to facilitate the protection of citrus plants during the frost season in places such as Florence, Rome, Nuremberg, El Escorial, or Fontainebleau. (**C**) Citrus winter conservatory, orangery, or "limonaia" at Boboli (Florence, Italy). Images (**A**,**B**) by Concepción Obón, (**C**) by Diego Rivera.

Table 1. Historical lexicography of Citrus in Western Mediterranean.

Citrus Taxa	English	Arabic	Spanish	French	Italian
Parent species					
Citrus medica L.	Citron [14]	*Utruj* [3] c. 1150, *Utrujj* [15], *Utruj* [16], *Walaitiraj*, *Energ*, *Tufāḥ al-yamānī* [3] c. 1150	*Cidros* [10], *Cidras* [21] since early 15th century	*Cédratier, Citronnier* [13] early 19th century	*Cedro* [11,12,13] 11nd cent
Citrus maxima (Burm.) Merr.	Pummelo [14], Shaddock [20]	*Zanbūʿ*, *Zambua* [15], *Bastanbūa*, *Zambūʿ*, *Raybūʿ* [3] c. 1150	*Zimboas* [21], *Toronja*, [6,14,21] late 16th century	*Pamplemousse, Pompoleon* [13,14] early 17th century	*Pompelone, Pompelmo* [12,22] early 19th century
Citrus hystrix DC.	Makrut lime, Combava [14]	none	none	*Combava* [13] early 19th century	*Papeda* [12] early 19th century
Citrus reticulata Blanco	Wild mandarin	none	*Mandarino* [23] early 21st cent	none	*Mandarino vero* [12] early 21st cent
Hybrids C. medica × C. máxima					
Citrus × lumia Risso	Lumia	*Astunbūtī* [15], *Bastanūa* [3] c. 1150 (for "Pompia" hybrids)	*Poncil*	*Lumie rhegine, Limettier Pomme d'Adam* [13] early 19th century	*Pomo d'Adamo* [12] 16th cent
Hybrids C. medica × C. hystrix					
Citrus × aurantiifolia (Christm.) Merr.	Lime [14]	*Līm* [15], *Allaymun* [3,4] c. 1100, *Banzahir, Luumi* [16]	*Limas*, *Limones* [6,21] late 16th century	*Limettier* [13] 20th century	*Limoncello*, *Limetta acida* [11,12,22] 16th cent
Citrus × aurantiifolia (Christm.) Merr.	Adam's Apple Lime	*Līm* [15] [3] c. 1150		*Limonier à fruit rond* [13] early 19th century	*Spongino, Pomo d'Adamo* [12,12] 16th century
Hybrids C. medica × C. reticulata × C. máxima					
Citrus × limon (L.) Osbeck var. *limon*	Lemon [14,20]	*Laymūn* [3,15], *Lāmūn* [3] c. 1150	*Limones*, [6,10,21] since early 15th century	*Citronnier, Limonier* [13] early 19th century	*Limone*[11,12] 16th century
Citrus × limon (L.) Osbeck var. *limetta* (Risso) Ollitrault, Curk and R.Krueger	Limetta	*Laymus* [3] c. 1150, *Līm* [15] c. 1300	*Lima agria*, *Lima dulce* 16th 19th century	*Limettier* [13] early 19th century	*Lima*, *Limetta*, *Limetta dolce*, *Limetta acida* [11,12,22] 17th century
Citrus × limettioides Tanaka	Palestine lime [12]	*Līm*, [15,16,18] c. 1300, *Limun helu* [16] late 20th century	*Lima dulce*, *Limetero árabe* [16,18] late 19th century	*Lime douce de Palestine* early 21st century	*Limetta palestina*, *Limetta dolce Indiana* [12] 20th century
Citrus × limonimedica Lush.	Citron lemon	*Laymūn* [15] c. 1300	*Ponciles* [1,6] late 16th century	*Limonier ponzin* [13] early 19th century	*Ponzino*, *Cedrato*, *Limone cedrato* [12, 22] late 16th cent
Citrus × mellarosa Risso	Mellarosa lemon [12]	*Astunbūtī* [15] c. 1300	*Melarrosa* [16] late 19th century	*Bergamote, Melarose* [13] early 19th century	*Mela rosa, Melarosa* [11, 12,22] 17th century
Citrus × bergamia (Risso) Risso and Poit.	Bergamot [14]	*Astunbūtī* [3,15] c. 1150	*Bergamota* [7,16] early 19th century	*Bergamotier* [13] early 19th century	*Bergamotto* [11,12,13,22] 17th century

Table 1. *Cont.*

Citrus Taxa	English	Arabic	Spanish	French	Italian
Hybrids C. reticulata* × *C. máxima					
Citrus × *aurantium* L. (sweet grafted on bitter)		*Nāranj* [3] c. 1150 [15] c. 1300, *Safāriya* [3] c. 1150?	*Cajeles, Naranjos zajaries,* [2,10] early 17th century	-	*Melangolo dolce* [22] 19th century
Citrus × *aurantium* L. var. *sinensis* L.	Sweet orange [14]	*Walnaarnj* [3] c. 1150	*Naranjos, Naranxos,* [6] late 13th century	*Oranger à fruits doux* [13] early 19th century	*Portogallo di Spagna, Arancio dolce* [11,12,22] 16th cent
Citrus × *aurantium* L. var. *aurantium*	Seville orange [14]	*Nāranj* [3,15]. *Walnaarnj* [3] c. 1150	*Naranjo amargo* [16]	*Bigaradier* [13] early 19th century	*Arancio forte, Melarancio, Melangolo* [11,12,22] 11th century
Citrus × *aurantium* L. var. *clementina* [5]	Clementine [14]	*Kalamintina* [17] early 20th century	*Clementina* [9] early 20th century	*Clémentinier* [13] early 20th century	*Clementine* [12] late 19th century
Citrus × *aurantium* L. var. *deliciosa* [5]	Mediterranean mandarin [14]	*Burtuqal almandri, Safandaa* [17] early 20th century	*Mandarina* [8] late 19th century	*Mandarinier* [13] early 20th century	*Mandarino, Mandarino commune* [12,22] early 19th century
Citrus × *aurantium* L. var. *paradisi* [5]	Grapefruit [14]	*Zanbūʿ* [15] c. 1300?	*Pomelo* [14] late 19th century	*Pamplemousse, Pomelo* [13,14] early 20th cent	*Pompelmo* [12] early 19th century [20] 17th century
Citrus × *aurantium* L. var. *myrtifolia*	Chinotto [14]	*Nāranj* [15] c. 1300		*Petit chinois* [13] early 19th century	*Chinotto, Melangolo a foglia di myrto* [11,12,13,22] 16th century
Citrus × *aurantium* L. var. *balearica* Risso and Poit.	Acidless orange [14]	*Burtuqal min ghayr himd* [17] early 21st century	*Naranja imperial, Naranja sucreña* [14] early 20th century	*Orange de Nice, Oranger de Majorque* [13,14] early 19th century	*Vaniglia, Arancio de Maiorca* [13] early 19th century
Citrus × *aurantium* L. var. *hierochuntium*	Blood orange [14]	*Nāranja* [19] 12th century *Alburtuqal almaltyu* [17] early 21st century	*Naranja sanguina* [14] early 20th century	*Oranger de Malte* [13] early 19th century	*Arancio sanguigno* [13] early 17th century

[1] (Soriano 1598; Cavanilles 1797), [2] (Guerra and Sánchez-Téllez 1984), [3] (Banqueri 1802; Hernández-Bermejo and García-Sánchez 1988), [4] (Laca 2003), [5] (Ollitrault et al. 2020), [6] (Cascales 1874). [7] (Anonymous 1822), [8] (Pardo Bazán 1881), [9] (López-Gómez 1957), [10] (RAE 2024), [11] (VoDIM 2024), [12] (Baldini and Sacaramuzzi 1982; Barbera 2023; Biscotti 2016; Tintori and Tintori 2000), [13] (Risso and Poiteau 1818–1822; Courboulex 1997; de l'Académie Française 2024), [14] (Saunt 1990), [15] (Akef and Almela 2021), [16] (Rivera et al. 1998), [17] (Glosbe 2024), [18] (Giner-Aliño 1893), [19] (García-Gómez 1978), [20] (García-Gómez 1978), [21] (Monardes 1551), [22] (Savastano 1883), [23] (Stampella et al. 2014). The "Cajeles" is believed to be a variety of orange resulting from grafting sweet orange onto bitter orange rootstock, characterized by its bittersweet taste and tough, resilient inner rind, as well as the membranous tissue that separates the segments of the pulp.

In Europe, lemon and orange trees were already being grown in some of the stately homes in France and Italy during the early 16th century and were protected from harsh weather conditions by large wooden shelters—though the building erected in the newly established Orto botanico di Padova in Padua, Italy, in 1545, is likely to have been the earliest identifiable orangery in Europe (Wearn and Mabberley 2016).

Tolkowsky (1938) mentions the images of citrus in Italian paintings and pottery from the 15th century by Ghirlandaio, Dalla Robbia, Sanno di Pietro, Andrea Mantegna, Girolamo dai Libri, and Giovanni Bellini.

In 1523, Leandro Alberti reported on the cultivation of sweet, sour, and medium-tasting oranges in Salerno (Barbera 2023). This could be the first report of acidless oranges, presently known in Italian as "Vaniglia" and in Spanish as "Grano de Oro", "de la Reina"

or "Sucreña", contrasted with common sweet oranges of "medium taste" and sour bitter "Seville oranges".

In Germany, oranges, limes (*Citrus* × *aurantiifolia* (Christm.) Merr.), and lemons were being grown at the Ducal Residence in Göstrow (Mecklenburg-Vorpommern) around 1628, as evident from a contemporary inventory of the garden (Wearn and Mabberley 2016).

In 1715, four large rectangular canvases arrived at the Medicean Villa della Topaia, near to the villa di Castello, on which Bartolomeo Bimbi depicted 116 numbered "Hesperides" or citrus fruits, often in pairs, supported by trellises adorned with orange blossoms and flanked by laurels (Figure 23). A cartouche at the base listed the names of the citrus fruits based on their origin, organoleptic qualities, shapes, and uses (Barbera 2023). Today, these paintings are located at the villa de Poggio a Caiano, and they fairly cover the known citrus diversity at that time, including examples from medieval and Renaissance gardens.

Figure 23. Bartolomeo Bimbi, four canvases of citrus: (**A**) Arance, bergamotti, cedri, limoni e lumie, 1715; (**B**) Arance, lime, limoni e lumie, 1715; (**C**) Melangoli, cedri e limoni, 1715; (**D**) Arance, cedri, lime, limoni e lumie, 1715. Images by Wikimedia Commons. (**A**) https://commons.wikimedia.org/wiki/File:Bartolomeo_bimbi,_arance,_bergamotti,_cedri,_limoni_e_lumie,_1715,_01.JPG, accessed on 12 November 2024; (**B**) https://commons.wikimedia.org/wiki/File:Bartolomeo_bimbi,_arance,_lime,_limoni_e_lumie,_1715.JPG, accessed on 12 November 2024; (**C**) https://commons.wikimedia.org/wiki/File:Bartolomeo_bimbi,_melagoli,_cedri_e_limoni,_1715,_01.JPG, accessed on 12 November 2024; (**D**) https://commons.wikimedia.org/wiki/File:Bartolomeo_bimbi,_arance,_cedri,_lime,_limoni_e_lumie,_1715,_01.JPG, accessed on 12 November 2024.

In the Medici Villa of Castello lies a secret garden known as the Limonaia, still in use today, which transforms into a dazzling chamber of scents when citrus trees bloom. The lemon houses follow the instructions of Giovanni Pontano's (2024a, 2024b) (Tilly 2020) "*De hortis Hesperidium*": "In summer, let them be exposed to the air, and in winter, let them be kept under the roofs, where the warmth will protect them" (Barbera 2023).

2.7.3. Citrus Collections as Symbols of Prestige and Luxury for Elite Families

The wondrous tree that is often depicted in romances as perpetually blossoming and bearing fruit, which in Boccaccio's Filocolo, written in 1336, still retains some magical qualities, appears in the framework of the *Decameron* simply as an orange tree. Concurrently, the tree symbolizes Nature's ceaseless renewal of its energies, while the orange, at times revered as sacred to Venus, imparts an erotic undertone to the scene. This orange tree, whose fruit, due to its resemblance to the apple, was associated with Venus and regarded as one of her attributes, adds a layer of symbolism to the narrative (Kern 1951; Barbera 2023).

Sweet oranges are characteristic fruit in these luxury gardens (Figure 23). In a lease contract from 1487, 'sweet oranges' in a garden in Guadagna, Palermo are mentioned (Barbera 2023).

In 1503, Pontano (2024a, 2024b) wrote his poetic exaltation of citrus fruits and their orchards (notably citrons and lemons), presenting their cultivation as a means of reconstructing the Garden of the Hesperides and reclaiming the mythical classical world. The author attributed various symbolic meanings to lemons and citrons. These meanings included associations with beauty, prosperity, immortality, and the divine. Lemons and citrons were depicted as symbols of rejuvenation, fertility, and the abundant blessings of nature. Additionally, they were linked to themes of luxury, extravagance, and indulgence, often evoking images of opulent gardens and mythical paradises. Furthermore, the author suggested that lemons and citrons carried cultural significance, representing a connection to the classical world and its legendary narratives, such as the Garden of the Hesperides (Tilly 2020).

Renaissance artists also admired the repeated blooming of citrus trees throughout the annual cycle, allowing mature fruits and fresh flowers to coexist on the same tree (Figure 24). In Canto VI of *Orlando Furioso*, written by Ludovico Ariosto in 1516, we encounter the description of Alcina's garden: "Lovely groves of sweet laurels, palm trees, and delightful myrtles, citrons and oranges bearing fruits and flowers, arranged in various forms and all beautiful" (Ariosto 1839; Barbera 2023). Torquato Tasso, in his *Gerusaleme Liberata*, first published in 1581, (Tasso 1822), extols the garden of Armida (Canto XVI), emphasizing the continuous presence of flowers: "…the breeze that renders the trees flowered with eternal blooms, endures eternal fruit, and while one blooms, the other ripens". (Tasso 1822; Barbera 2023).

One of the most significant aspects of Renaissance collecting was the interest in rare, aberrant, and apparently useless fruits, which could be labelled as vegetal monstrosities, such as "fetiferous" oranges or lemons, horned oranges, grooved oranges or lemons, and chimeras in which several types were mixed in a single fruit (Ferrari 1646; Freedberg 1992; Freedberg 1996; Freedberg 2008; Zytaruk 2011; Baldassarri 2022).

In the realm of citrus fruits, chimeras are referred to with the Italian term "*bizzarrie*", as they belong to the category of monstrous citrus fruits, which also include fruits with horns, fingers, or duplicated fruits. These peculiar fruits were highly prized and sought after by Renaissance collectors (Aldrovandi 1658; Commelin 1676; Baldassarri 2022; Pavesi 2023).

Plant chimeras originate from a mixture of different genetically but compatible cells within the same bud. This can occur because of anomalies in graft development, for example. Chimeras are primarily recognized by the appearance of irregular fruits that combine features of the species involved in the chimera. These combinations can also be detected in the leaves and flowers. In fruits, chimeras typically manifest as bands and streaks where the traits of each species alternate, although sometimes one species may predominate.

Della Porta, in his influential work *Magiae naturalis sive de miraculis rerum naturalium*, first published in 1584, documents several hypothetical botanical chimeras achieved through grafting techniques, exemplifying the period's experimental approach to horticultural manipulation and the contemporary understanding of plant hybridization (Della Porta 1650a, 1650b; Baldassarri 2022).

Figure 24. Fruit and flowers of orange tree, together with roses or peonies, in the decoration of the Loggia di Psyche in the Villa Farnesina (1517-18), from the garlands surrounding the scene "Psyche Brings a Vessel up to Venus" by Raffaello and his workshop (Rome). Image by Concepción Obón.

Examples of chimeras documented in Medici collections include bitter orange and poncil, bitter orange and lemon, or bitter orange and citron (Pavesi 2023). A characteristic of some chimeras is the presence of branches on the same tree that produce normal fruits of each of the species involved and others that produce varying degrees of "*bizzarria*".

3. Discussion

3.1. Multidisciplinary Analysis of Citrus Symbolism: Contribution of Biological, Archaeobotanical, Iconographic, and Textual Sources

Archaeobotanical evidence for citrus is based on pollen, seeds, and fruit fragments (Pagnoux et al. 2013). Pollen (Figure 25A,B) is referred to as *Citrus*, sometimes with reference to a specific citrus type; however, when it is found along large chronological sequences, it is difficult to discern what is original and what is a result of contamination.

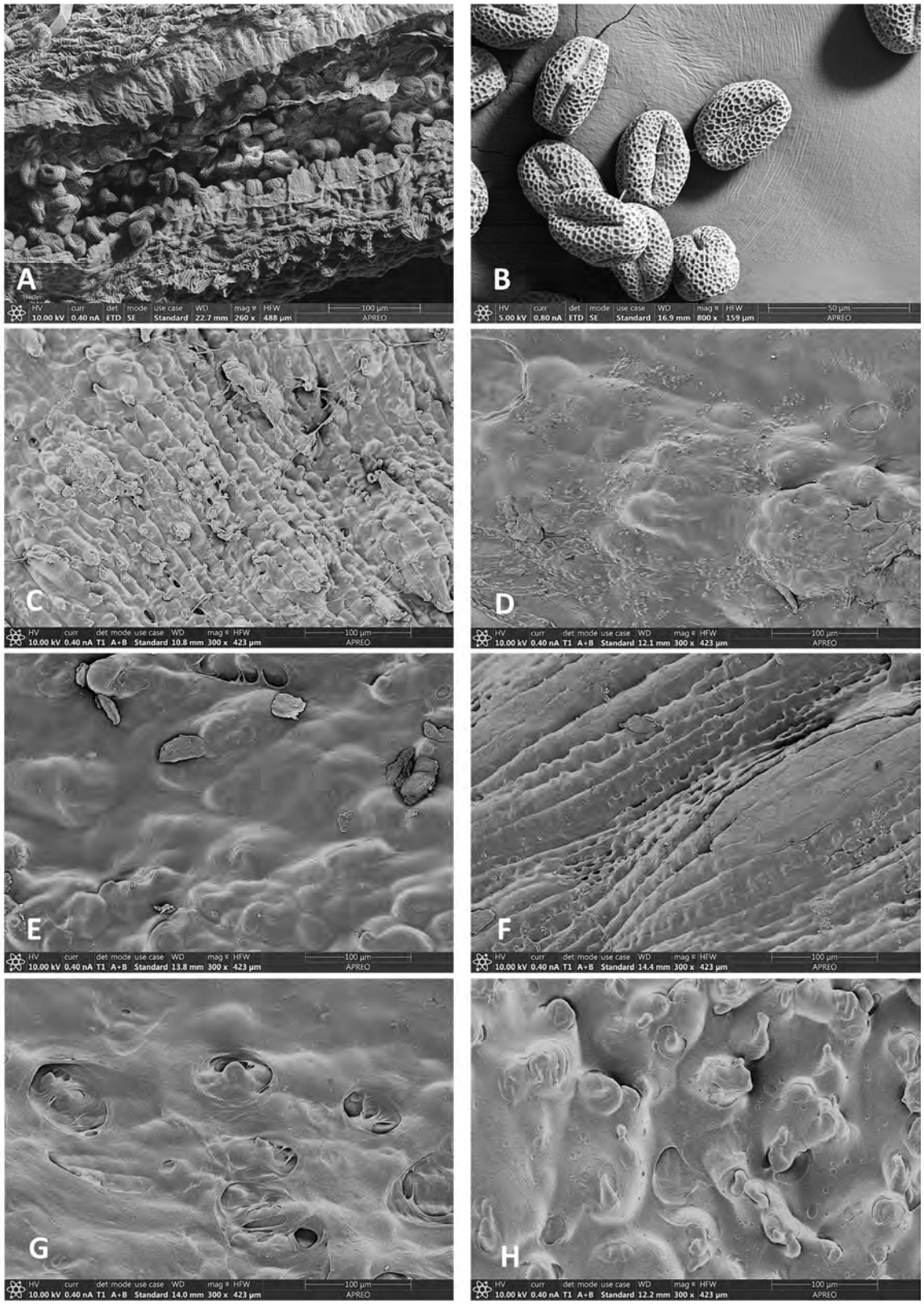

Figure 25. Citrus pollen and seed surface patterns, SEM images: (**A**) *C. medica* var. *sarcodactylis* anther with pollen grains and (**B**) *C. medica* var. *sarcodactylis* pollen grains; (**C**) *C.* × *aurantiifolia* seed surface; (**D**) *C.* × *limon* var. *limetta* seed surface; (**E**) *C.* × *limon* var. *limon* seed surface; (**F**) *C. medica* "etrog" seed surface; (**G**) *C.* × *aurantium* var. *aurantium* seed surface; (**H**) *C.* × *aurantium* var. *paradisii* seed surface. Images by Teresa Coronado Parra, Service of Microscopy, Murcia University.

In the case of seeds, these can individually be radiocarbon dated, and their taxonomic identification relies not only on morphometrics but also on fine analyses of seed surface patterns using scanning electron microscopy (Figure 25C–G) (Pagnoux et al. 2013).

In examining the vernacular terminology across various historical records, assigning accurate names to cited citrus fruits poses challenges (Table 1). For instance, in Italian treatises from the 14th and 15th centuries, the term "*arancia*" was infrequently mentioned, evolving into "*melerancia*" on a 15th-century list of purchases by the Lords of Florence. The latter term, described as "*pommes oranges*" in *Le Ménagier de Paris* from the late 14th century, denotes the sour orange (*Citrus* × *aurantium*) and its acidic juice. The terms "*citrangole*" or "*melangole*", prevalent in the early 14th century in Liber de Coquina, present difficulties in specification but may encompass fruits distinct from *arancia*. In Tuscan culinary texts from the late 14th century, "*citrangole*" appears alongside instructions for recipes, indicating sour oranges or citrons. In Spain, "*naranjas*" refers to cooking oranges, with "*naranjas agras*" distinguished from sweet oranges in a 1450 stew recipe by Roberto de Nola. Regardless of terminology, these oranges were consistently sour in culinary contexts. In Italy and Spain, lemons are termed "*limoni*", "*limones*" or "*limoncelli*", "*limoncillos*", derived from the Arabic "*laymun*", while Italian texts also mention "*lumie*", "*lomie*", or "*limia*", referring to limes with less bitter rind (Table 1). Ambiguity persists in identifying fruits, exemplified by the term "*chitron*" in *Le Ménagier de Paris*, which may denote candied citron, lemon, or lime (Ruas et al. 2015; Ruas et al. 2017).

Medieval iconographical sources demand caution due to limitations affecting the corpus documents utilized. Prior to the 13th century, illustrations primarily served symbolic purposes, reflecting divine glory rather than realism. The gradual emergence of naturalism during the 14th and 15th centuries led to more realistic depictions, yet even in herbariums, determining represented species remains challenging. Illustrated encyclopedias and herbariums provided scholars, botanists, and physicians with varying degrees of accuracy regarding plants' existence and descriptions. Agronomical treatises depicted cultivation scenes in books of hours and calendars, offering insights into their cultivation practices and geographic origins. Similarly, trade tax lists documented the geographical provenance and commercial value of fresh or processed fruits, such as citrus. Culinary treatises shed light on consumption methods, culinary roles, and the social status associated with fruit consumption (Ruas et al. 2015; Ruas et al. 2017).

The representations of lemons in mid-17th-century Dutch paintings describe their numerous functions: they represent market and culinary practices, they are objects that convey interest in Greek mythology and Protestant moral values, and they reflect interest in vision and perception (Piepmeier 2018).

When considering the potential emergence of ornamental hybrids in Mediterranean gardens, it is essential to note that among the four basic ancestral species—*C. medica*, *C. reticulata*, *C. maxima*, and *C. micrantha*—only one, *C. medica*, seems to have been present in the region for over two millennia. Another species, *C. maxima*, had been introduced during the Western Muslim period. However, the other two were represented in the area by their interspecific hybrids. In the case of *C. reticulata*, it was represented by *C.* × *limon* and *C.* × *aurantium*, while for *C. micrantha*, it is *C.* × *aurantiifolia*. The coexistence of *C. medica* and *C. maxima* facilitated the emergence of various "lumia" hybrids originating between these species.

In the later stages of the Renaissance, gardens exhibited remarkable citrus diversity, stemming from recent imports from Asia, including the Philippines, China, and India, and inherited from longstanding cultivation in the gardens and orchards of the Western Islamic world. Through our analysis of descriptions, and particularly the illustrations by Ferrari (1646), Volkamer (1708), and the paintings by Bartolomeo Bimbi from the Medici collections circa 1700, it becomes evident that Renaissance gardens and their successors featured citrus with yellow-peeled fruits. Among these, the most notable in terms of varietal diversity were citron lemons (*Citrus* × *limonimedica* Lush.), lemons (*Citrus* × *limon* (L.) Osbeck var. *limon*), and citrons (*Citrus medica* L.). Additionally, though with less diver-

sity, were lumias (*Citrus* × *lumia* Risso), limettas (*Citrus* × *limon* (L.) Osbeck var. *limetta* (Risso) Ollitrault, Curk and R.Krueger), limes (*Citrus* × *aurantiifolia* (Christm.) Merr.), sour oranges (*Citrus* × *mellarosa* Risso), bergamots (*Citrus* × *bergamia* (Risso) Risso and Poit.), and grapefruits (*Citrus* × *aurantium* L. var. *paradisi*), often confused with large oranges or smaller pummelos, while large pummelos were scarce and less diverse (*Citrus maxima* (Burm.) Merr.).

Among oranges with orange-colored fruits, notable for their extensive cultivated varieties, were bitter oranges (*Citrus* × *aurantium* L. var. *aurantium*) and common sweet oranges (*Citrus* × *aurantium* L. var. *sinensis* L.), alongside others that were fewer in number, including acidless oranges, blood oranges, and navels. Additionally, the chinotto or Chinese bitter orange (*Citrus* × *aurantium* L. var. *myrtifolia*), described by Ferrari (1646) among the Barberini collections, should be noted (Figures 10 and 11).

It is crucial to determine the timing of mandarins' introduction into the Mediterranean region, especially the wild varieties. Currently, evidence of their use in Western Muslim or Renaissance gardens is scant and unreliable. The introduction of common mandarins, with an 80% contribution from wild mandarins, has been traced back to the early 19th century. It was not until the 19th and early 20th centuries that Mediterranean mandarins (*Citrus* × *aurantium* L. var. *deliciosa*), introduced by the English via Malta, Sicily, and Campania, and clementines (*Citrus* × *aurantium* L. var. *clementina*) [originating from a spontaneous pollination of a variety of sweet orange with pollen from one of these Mediterranean common mandarins, that occurred in Miserghin, northern Algeria, during the French protectorate] became widespread across the Mediterranean. In these clementines, the proportion of wild mandarin decreased by 20%, while that of pummelo increased proportionally. Meanwhile, other citrus fruits like kaffir lime (*Citrus hystrix* DC.) and many others gained popularity throughout the 20th century (Risso and Poiteau 1818–1822; Gallesio 1840; Savastano 1883; Giner-Aliño 1893; Rivera et al. 1998; Trisciuzzi 2009; Biscotti 2016; Tintori 2024).

3.2. Examination of Divergent Views on Citrus Symbolism

Oranges and lemons, rich in symbolic significance, featured prominently in medieval iconography, particularly in religious contexts. Representing purity and virginity, orange tree fruits and blossoms often adorned depictions of the Virgin Mary in Italy during the 15th century. Similarly, lemon trees were linked symbolically to oranges, both serving as symbols of salvation. In Flemish paintings from the late 15th century, baby Jesus is portrayed holding an orange instead of the traditional apple, while lemons also symbolize redemption in artworks from the Netherlands. This association extends to religious themes, as seen in Domenico Ghirlandaio's "*Cenacolo di Ognissanti*" in Florence, where lemon and citron trees grace the background landscape (Ruas et al. 2017).

3.3. Transformation of Citrus Varieties from Symbols of Luxury to Global Agricultural Staples

Citrus tree collections were fundamentally ornamental where curiosity and sensual enjoyment prevailed. However, these same plants in the hands of the common people became important resources for health or food. Notably, certain citrus varieties gained acclaim for their rarity and uniqueness, shaping both horticulture and global agriculture. This was the case for *aurantii foetiferi*, oranges with apical navels. The navel orange, which initially emerged as a prized botanical specimen among elite collectors, has since evolved into the world's predominant cultivar group of sweet oranges (*Citrus* × *aurantium* var. *sinensis*). Its transformation from a horticultural rarity to a globally dominant commercial variety represents a significant development in citrus cultivation.

Aurantium foetiferum and *Limon citratum alterum* are notable examples. Ferrari (1646) considered their subapically inserted secondary small fruits as evidence of exceptional fertility. Their fruit apex, resembling a human navel, led to them being named "navels". Tolkowsky (1938) references Ferrari's 1646 documentation of a significant historical observation by the medieval scholar Badr al-Dīn al-Dimashqī (1310–1377 CE), who described

a distinctive citrus variety indigenous to the Canary Islands. The specimen was characterized by an internal secondary fruit formation, a morphological feature that strongly suggests it was an early example of a navel orange cultivar. This historical account provides compelling evidence for the presence of navel orange mutations in Mediterranean trade networks during the medieval period.

Refining the narrative of the navel orange's journey, Spanish and Portuguese introductions to the Canary Islands and Madeira paved the way for cultivation in Brazil's Bahia region. A bud mutation yielded the prized "Selecta" cultivar, later brought to the USA by William Saunders in 1870. Saunders, prompted by a letter highlighting a seedless, flavorful orange, eventually received 12 trees after initial setbacks. Two of these, dubbed the "Bahia navel", were gifted to Eliza Tibbets in Riverside, California, in 1873. The navel orange thrived, earning the moniker "Riverside navel" before becoming the "Washington navel" in honor of its source city or the first president. As a seedless variety, all descendants stem from grafts of these original trees. Remarkably, one such tree, now over 140 years old and thriving in downtown Riverside, stands as a testament to this enduring legacy (Barbera 2023; USDA 2024a).

Global orange production for 2023/24 is expected to increase slightly to 48.8 million tons, despite reduced output in Brazil and the European Union. This decrease is outweighed by larger harvests in Argentina, the United States, and Turkey. Both consumption and exports have risen in line with higher production levels. Oranges remain the predominant citrus crop, with popular export varieties such as navel and Valencia oranges leading the way (USDA 2024b). The global gross production value, amounting to USD 88.73 billion in 2022, underscores the economic significance of citrus, supporting millions involved in its cultivation, processing, and distribution and playing a vital role in livelihood generation. Moreover, the total production volume, reaching 16.63 billion tons, underscores citrus's essential contribution to global food security and supply chains. Citrus is also a highly traded commodity, with Spain emerging as the foremost exporter, shipping citrus products valued at USD 3.65 billion in 2022 (FAO 2022; Observatory of Economic Complexity 2022), featuring a diverse range of varieties such as oranges, mandarins, and lemons. Beyond economic gains, citrus fruits hold cultural significance, deeply rooted in local traditions and culinary practices. Following Spain, South Africa exported citrus valued at USD 1.85 billion USD in 2022, leveraging its favorable climate for year-round production to become a key player in the global market, thereby contributing to livelihoods, rural development, and foreign exchange earnings. China has also emerged as a significant player, with citrus exports totaling USD 1.02 billion, including mandarins, pomelos, and other varieties, bolstering its economy and trade relations. Turkey, exporting citrus products worth USD 952 million, plays a crucial role in employment, agro–industrial growth, and rural stability, offering a diverse range of sweet oranges, lemons, and tangerines. Egypt completes the top five exporters, with citrus exports totaling USD 941 million, contributing to food security, income generation, and national development. Furthermore, the Netherlands, serving as a critical European distribution hub, imports 7.69% of the global citrus volume and re-exports 4.38% due to its strategic location, albeit unsuitable for citrus cultivation. In essence, the global citrus trade not only drives economies but also preserves cultural heritage and sustains livelihoods.

In parallel, the ornamental citrus (ornacitrus) industry emerged in Italy during the late 1960s as a strategic adaptation to citriculture market pressures. Italy maintains its European prominence in this sector, producing over 5.5 million ornamental specimens annually, primarily comprising *Citrus* and *Fortunella* taxa, with *C. limon* predominating. Sottile et al. (2019) examined how breeding innovations and horticultural techniques have shaped this specialized industry, which has subsequently expanded across Mediterranean Europe, particularly in Portugal, Spain, and Greece.

In summary, the fervent pursuit of luxury and collecting within the elite circles of Roman, Western Muslim, and Renaissance societies, particularly concerning citrus cultivation, not only fostered agricultural advancements but also elevated citrus fruits to a pivotal position in global food and cultural spheres.

4. Materials and Methods

The study of the Medici citrus collections, still thriving through successive clonal propagation events in the gardens of Boboli, Villa de Castello, Poggio a Caggiano, and the Botanical Garden of Florence, has been crucial in understanding the diversity of citrus in Renaissance gardens. This endeavor was further fortified by examining the Tintori family's greenhouses, which house hundreds of citrus varieties from various origins, particularly Italian locales, and the Medici collections (Tintori 2024). Works by Ferrari (1646) and Volkamer (1708), as well as paintings by Bimbi, were pivotal in confirming varietal names and fruit identifications from these collections. Other sources of information included public and street markets in regions like Puglia, Sicily, Campania, Tuscany, and Rome in Italy, and Murcia, Granada, Orihuela, Almoradí, and Valencia in Spain. Collections from the Kolymbetra Garden in the Valley of the Temples of Agrigento, and the Garden of the Hesperides at the University of Murcia were also studied, boasting a wide array of Spanish, French, and Portuguese citrus, as well as Sicilian varieties from La Palmara nursery (Furnari, Messina, Italy), and Medici specimens from the Oscar Tintori nursery (Tintori 2024). Finally, descriptions from Andalusian authors were revisited in their original Arabic form to recover the Andalusian names of citrus cultivated between the 10th and 13th centuries.

The selection of texts and topics was primarily based on the authors' experience, but a comprehensive review using Google Scholar proved to be useful. The lexicographical databases consulted included CORDE from the Real Academia Española for Spanish (RAE 2024), Harvard (2024) Ancient Texts Resources for Latin, Stazione Lessicografica VoDIM (2024) and ArchiDATA (2024) for Italian, and the Dictionnaire de l'Académie Française (2024) and the Trésor de la langue Française informatisé (TLFi 2024) for French. The selection of images was made from the author's image bank and references from the works consulted.

We paid particular attention to the iconographic imagery in two significant texts: the *Ḥadīth Bayāḍ wa Riyāḍ*, Vatican codex Vat. ar. 368 (D'Ottone 2010, 2013; Vaticana 2024), and the *Cantigas de Santa Maria* by Alfonso X the Wise. In the latter case, the Códice Rico from the Royal Library of the Monastery of San Lorenzo de El Escorial, circa 1280–1284, contains one hundred and ninety-five cantigas (originally two hundred), making it the first manuscript of the four preserved, where text, music, and image intertwine. Each poem is accompanied by an illuminated folio illustrating the miracle, with two folios for poems ending in five, a number especially associated with Marian devotion, thus shaping the manuscript's structure (Alfonso X 2024; Patrimonio 2024).

In terms of buildings, we focused on the analysis of the vegetal set of scenes on walls and vaults apparently linked to western Muslim *bustāns* in the Hall of the Kings of the Alhambra (1396–1408 CE), the palace of the Zisa in Palermo (1165–1180 CE), and the hall of the Norman king Ruggero II (1131–1154 CE) in the royal palace of Palermo. For earlier and later periods, we focused our search on recognizable images of citruses.

The correction of manuscript texts was conducted using DeepL (2024), Claude (2024) 3.5, and ChatGPT (2024) 3.5.

5. Conclusions

This comprehensive investigation into the cultural and artistic significance of citrus in Mediterranean civilization yields several significant findings while simultaneously opening new avenues for scholarly inquiry.

The earliest Western textual reference to citrus fruits is found in Theophrastus' *De Causis Plantarum* from the 4th century BCE, providing a foundational botanical description. Additional evidence from Roman archaeological sites dating back to the 1st century CE confirms the presence of citrus seeds, citrons, and lemons, suggesting their early integration into Mediterranean horticulture. These varieties laid the groundwork for subsequent citrus cultivation, which expanded through hybridization involving both imported species and local varieties. Citrus fruits have been deeply intertwined with the cultural and symbolic

landscape of the Mediterranean since the 1st millennium BCE, evolving significantly in diversity over time. Initially, yellow-hued varieties such as citrons and lemons dominated, with orange-colored citrus fruits gaining prominence during the Middle Ages. Citrus fruits also occupied prominent places in myth and legend, from the mythical Garden of the Hesperides to Christian narratives of Eden's forbidden fruit.

The depiction of citrus fruits has appeared in numerous works of art since Roman times, highlighting an enduring fascination with their form, color, volume, and texture. Beyond their fruits, citrus trees themselves are frequently represented, often with varying degrees of realism. Our analysis reveals a notable evolution in artistic representation across diverse cultural contexts. Roman artistry exhibited remarkable naturalistic precision, particularly evident in mosaic and fresco techniques. This naturalism gave way to more abstracted forms in medieval Islamic art, where citrus motifs acquired distinct geometric characteristics, as exemplified in the Norman Sicilian palaces. The Renaissance subsequently ushered in a return to naturalistic representation, accompanied by enhanced botanical documentation.

The current findings suggest a nuanced understanding of how religious and cultural practices have influenced botanical preservation. The Jewish tradition's ritualistic use of the etrog citron, particularly in the Feast of Tabernacles, represents a compelling example of how religious observance can ensure the preservation of specific botanical varieties across millennia. Similarly, the integration of orange trees into Islamic architectural spaces, such as the Court of the Oranges at Córdoba's Mosque, demonstrates the adaptation of citrus into sacred architectural programs.

While naturalistic depictions are uncommon in Western Muslim art, the symbolic importance of citrus in this culture is evident through frequent references in poetry, agricultural treatises, and religious texts. The prominence of orange trees is particularly underscored by their use in significant spaces, such as the Court of the Oranges at the Mosque of Córdoba, which confirms their cultural and aesthetic relevance. Additionally, certain trees illustrated in the *Ḥadīth Bayāḍ wa Riyāḍ* manuscript, as well as those depicted on the ceilings of the Hall of the Kings in the Alhambra of Granada, may be interpreted as representations of orange trees, further attesting to their symbolic resonance within this artistic and architectural tradition. Key figures like Ibn al-ʿAwwām contributed to the classification of citrus diversity, distinguishing between citrons, oranges, pummelos, grapefruits, and lemons.

The distinctive geometric representation of orange trees in the mosaics of Norman Sicilian palaces suggests the practice of an advanced form of topiary art, employed to shape the orange tree canopies with remarkable precision.

The presence of citrus fruits among the elites of Christian Spain has been well documented since at least the 13th century CE, as evidenced by illustrated manuscripts and official records. Particularly noteworthy is the introduction of oranges into France, originating from the royal collections at the Castle of Olite in Navarra, linked to the story of the Grand Bourbon orange tree. In Portugal, the presence of citrus fruits among the elite was documented as early as the 15th century.

This study advances the field's methodological framework through its systematic analysis of medieval citrus iconography. The research highlights the challenges inherent in species identification within medieval artistic representations, particularly when compared with the precise naturalism of Roman-era depictions. This methodological insight underscores the necessity of integrating textual sources with visual analysis for accurate species identification.

While this investigation advances our understanding of citrus in western Mediterranean cultural history, several areas merit further scholarly attention. Future research should pursue three primary directions, as follows.

First, a more comprehensive investigation of the relationship between citrus cultivation and broader garden design principles is warranted, particularly concerning the interaction between citrus and other ornamental species in both *bustān* and Renaissance gardens.

Second, the development of advanced computational methodologies, specifically employing artificial intelligence for image analysis, offers promising opportunities for enhancing species identification in historical artwork. This approach could significantly advance our understanding of citrus representation across different historical periods and cultural contexts.

Third, a more integrated approach to studying the symbolic dimensions of citrus across diverse cultural traditions could yield valuable insights into cross-cultural exchange and influence in the Mediterranean region.

These findings and recommendations contribute to an emerging framework for understanding the complex role of citrus in Mediterranean cultural heritage, while establishing clear directions for future scholarly investigation. The integration of traditional art-historical methods with emerging technological approaches promises to yield rich new insights into this significant aspect of Mediterranean cultural history.

Author Contributions: Conceptualization, D.R. and C.O.; methodology, D.R., J.N. and I.C.; software, D.-J.R.-O.; validation, C.O.; formal analysis, D.R.; investigation, J.V.; resources, J.N.; data curation, J.V. and I.C.; writing—original draft preparation, D.R.; writing—review and editing, all authors; visualization, D.R. and C.O.; project administration, J.N.; funding acquisition, J.N. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Agencia Estatal de Investigación (Ministerio de Ciencia e Innovación), PID2022-141272NB-I00 and project ArqMUNIA "Arquitecturas de prestigio en las almunias medievales: transmisión de modelos desde la Antigüedad al Renacimiento".

Data Availability Statement: The original contributions presented in this study are included in the article. Further inquiries can be directed to the corresponding author.

Acknowledgments: We acknowledge the assistance by María Teresa Coronado Parra of the Microscopy Services of the Universidad de Murcia in obtaining SEM images.

Conflicts of Interest: The authors declare no conflicts of interest.

References

Académie Française. 2024. Dictionnaire de l'Académie Française. Available online: https://www.dictionnaire-academie.fr/ (accessed on 15 April 2024).

Akef, Walid, and Iñigo Almela. 2021. Nueva lectura del capítulo 157 del tratado agrícola de Ibn Luyūn. *Al-Qanṭara* 42: e02. [CrossRef]

Al-Bukhari, Muḥammad ibn Ismail. 2023. *Encyclopedia of Sahih Al-Bukhari*. New York: Arabic Virtual Translation Center. Available online: https://www.google.es/books/edition/Encyclopedia_of_Sahih_Al_Bukhari/coMlEAAAQBAJ?hl=es&gbpv=1 (accessed on 15 April 2024).

Al-Bukhari, Muḥammad ibn Ismail [Al-Bujārī]. 2002. *Ṣaḥīḥ*. Damasco-Beirut: Dār Ibn Kaṯīr.

Al-Bukhari, Muḥammad ibn Ismail [El-Bokhâri]. 1992. *Les Traditions Islamiques*. 4 vols, Abidjan: Jean Mabille éd.

Al-Kutubī, Muḥammad ibn Šākir. 1974–1975. *Fawāt al-Wafayāt*. 5 vols, Edited by Iḥsān ʿAbbās. Beirut: Dar Sader.

Al-Maqqarī, Aḥmad b. Muḥammad. 1968. *Nafḥ al-Ṭībb min gusn al-Andalus*. 8 vols, Edited by Iḥsān ʿAbbās. Beirut: Dar Sader.

Aldrovandi, Ulise. 1658. *Vlyssis Aldrovandi Patricii Bononiensis Dendrologia Natvralis Scilicet Arborvm Historia Libri Duo*. Bolonia: Baptista Ferronii.

Alfonso X. 2024. Cantigas de Santa María, Códice Rico. Available online: https://rbme.patrimonionacional.es/s/rbme/item/11337#?xywh=-5276,-312,14295,6239 (accessed on 12 November 2024).

Alhambra Patronato. 2024. Sala de los Reyes. Available online: https://www.alhambra-patronato.es/edificios-lugares/sala-de-los-reyes (accessed on 30 April 2024).

Alonso de Herrera, Gabriel. 1513. *Obra de Agricultura Copilada de Diuersos Auctores por Gabriel Alonso de Herrera de Mandado del muy Illustre y Reuerendissimo Señor el Cardenal de España Arçobispo de Toledo*. Alcalá de Henares: Arnao Guillén de Brocar.

Andrews, Alfred C. 1961. Acclimatization of Citrus Fruits in the Mediterranean Region. *Agricultural History* 35: 35–46.

Anonymous. 1822. *El Repostero Famoso, Amigo de los Golosos*. Madrid: Imprenta Eusebio Álvarez.

ArchiDATA. 2024. ArchiDATA—Archivio di (retro)Datazioni Lessicali. Available online: https://www.archidata.info/ (accessed on 15 April 2024).

Ariosto, Ludovico. 1839. *L'Orlando Furioso di Ludovico Ariosto*. Paris: Lefevre, vol. 1.

Baldassarri, Fabrizio. 2022. A Clockwork Orange: Citrus Fruits in Early Modern Philosophy, Science, and Medicine, 1564–1668. *Nuncius* 37: 255–83. [CrossRef]

Baldini, Enrico, and Franco Sacaramuzzi. 1982. *Agrumi, Frutta e Uve Nella Firenze di Bartolomeo Bimbi Pittore Mediceo*. Firenze: Edizzioni fuori Commerzio.

Banqueri, Joseph Antonio. 1802. *Libro de Agricultura. Su Autor el Doctor Excelente Abu Zacaria Iahia Aben Mohamed ben Ahmed En El Awam Sevillano*. Madrid: Imprenta Real. Available online: https://archive.org/details/b30457282_0001/page/n5/mode/2up (accessed on 24 April 2024).
Barbera, Giuseppe. 2007. Parchi, frutteti, giardini e orti nella Conca d'oro di Palermo araba e normanna. *Italus Hortus* 14: 14–27.
Barbera, Giuseppe. 2023. *Agrumi, Una Storia del Mondo*. Milano: Il Saggiatore.
Barbera, Giuseppe, and Manlio Speciale. 2015. Meraviglie Botaniche Giardini e Parchi di Palermo. Palermo. Soprintendenza per i Beni Culturali e Ambientali di Palermo, Assessorato dei Beni Cultural e dell'Identità Siciliana. Available online: https://www2.regione.sicilia.it/beniculturali/dirbenicult/info/pubblicazioni/lemappedeltesoro/le_mappe_del_tesoro/volume%2015%20ITA%20low.pdf (accessed on 15 April 2024).
Barbera, Giuseppe, Patrizia Boschiero, and Luigi Latini. 2015. *Maredolce-La Favara. Premio Internazionale Carlo Scarpa per il Giardino 2015 XXVI*. Treviso: Fondazione Benetton Studi Ricerche-Antiga Edizioni.
Bellanca, Lina. 2015. *Monumenti Normanni. Sollazzi e Giardini*. Palermo: Soprintendenza per i Beni Culturali e Ambientali di PalermoAssessorato dei Beni Culturali e dell'Identità Siciliana.
Ben-Sasson, Rivka. 2012. Botanics and iconography images of the lulav and the etrog. *Ars Judaica* 8: 7–22.
Ben-Sasson, Rivka. 2023. The Etrog Citron in Art. In *The Citron Compendium, The Citron (Etrog) Citrus medica L.: Science and Tradition*. Edited by Eliezer E. Goldschmidt and Moshe Bar-Joseph. Cham: Springer, pp. 413–39. [CrossRef]
Biscotti, Nino. 2016. *Storie di Agrumi e Paesaggi I pomi Citrini dello Sperone d'Italia*. Foggia: Edizioni del Rosone F. Marasca.
Borgongino, Michele. 2006. *Archeobotanica, Reperti Vegetali da Pompei e dal Territorio Vesuviano*. Rome: Sopraintendenza Archeologica de Pompeii—"L'Erma" di Bretschneider.
Campos-Perales, Angel. 2018. La compra de la Casa de la Huerta, sus jardines, búcaros, porcelanas y vidrios de San Juan de Ribera por el duque de Lerma. In *Ecos culturales, artísticos y arquitectónicos entre Valencia y el Mediterráneo en Época Moderna*. Edited by Mercedes Gómez-Ferrer Lozano and Yolanda Gil. Valencia: Universitat de València, pp. 309–27.
Casares, Manuel, José Tito, and María de los Reyes González-Tejero. 2010. The Moorish Myrtle, History, and Recovery of Alhambra Garden Lost Species (*Myrtus communis* L. subspecies *baetica* Casares et Tito). Paper presented at XXVIII International Horticultural Congress on Science and Horticulture for People (IHC2010): International Symposium on Advances in Ornamentals, Landscape and Urban Horticulture, Lisbon, Portugal, August 22; pp. 1237–50.
Cascales, Francisco. 1874. Discursos Históricos de la muy Noble y muy leal Ciudad de Murcia y su Reino por Francisco Cascales. Murcia. Librería de Miguel Tornel y Olmos. Available online: https://bvpb.mcu.es/es/catalogo_imagenes/grupo.do?path=162410 (accessed on 23 April 2024).
Cátedra de Patrimonio y Arte Navarro. 2024. El Palacio de Olite. Available online: https://www.unav.edu/web/catedra-patrimonio/itinerarios-visitas/el-palacio-de-olite (accessed on 15 April 2024).
Cavanilles, Antonio Josef. 1795–1797. *Observaciones Sobre la Historia Natural, Geografía, Agricultura, Poblaciones y Frutos del Reyno de Valencia*. Madrid: Imprenta Real.
Charton, Edourd. 1857. Le Grand Bourbon. *Magasin Pittoresque* 25: 217–18.
ChatGPT. 2024. ChatGPT—Get Instant Answers, Find Creative Inspiration, Learn Something New. Available online: https://openai.com/chatgpt (accessed on 15 April 2024).
Claude. 2024. Claude 3.5 Sonnnet (New). Available online: https://claude.ai/new (accessed on 26 October 2024).
Clément-Mullet, Jean. 1864. *Le Livre d'Agriculture d'Ibn al Awam*. Paris: Albert L. Hérold.
Commelin, Johannes. 1676. *Nederlantze Hesperides. Dat is Oeffening en Gebruik Van de Limoen-en Oranje Boomen Gestelt na den Aardt en Climaat der Nederlanden*. Amsterdam: Marcus Doornik.
Córdoba. 2024. Patio de los Naranjos, Mezquita de Córdoba. Available online: https://www.mezquitadecordoba.org/patio-naranjos.html (accessed on 15 April 2024).
Courboulex, Michel. 1997. *Les Agrumes*. Paris: Rustica Editions.
Curk, Franck, François Luro, Giovanni Minuto, and Gianni Nieddu. 2022. Les Agrumes du Nord de la Méditerranée. Ajaccio. Éditions Alain Piazzola. Available online: https://www.static.inrae.fr/sites/default/files/agrumesnordmediterranee.pdf (accessed on 12 November 2024).
D'Ottone, Arianna. 2010. Il manoscritto Vaticano Arabo 368 Hadith Bayad wa Riyad. Il codice, il testo, le immagini. *Rivista di Storia della Miniatura* 14: 55–70.
D'Ottone, Arianna. 2013. *La Storia di Bayad e Riyad (Vat. Ar. 368)*. Una nuova Edizione e Traduzione. Città del Vaticano: Biblioteca Apostolica Vaticana.
Daranatz, Jean B. 1922. Un oranger navarrais dit le Grand Connétable. *Revista Internacional de los Estudios Vascos* 13: 456–57.
De los Ríos, Gregorio. 1592. *Agricultura de Jardines que Trata de la Manera que se han de Criar, y Conservar las Plantas*. Madrid: P. Madrigal.
De los Ríos, Gregorio. 1620. Agricultura de Jardines que trata de la manera que se han de criar, y conservar las plantas. In *Agricultura General*. Edited by Alonso De Herrera. Madrid: Viuda de Alonso Martín, pp. 243–71.
De Toledo, Pedro. 1995. *Guia de los Perplejos de Maimónides. BNM ms. 10289, 1419–1432*. Edited by Moshé Lazar. Madison: Hispanic Seminary of Medieval Studies.
DeepL. 2024. DeepL Translator. Available online: https://www.deepl.com/translator (accessed on 15 April 2024).
Del Moral, Celia. 2009. Jardines y fuentes en al-Andalus a través de la poesía. *Miscelánea de Estudios Árabes y Hebraicos, Sección Árabe-Islam* 58: 223–49.

Della Porta, Giovan Battista. 1650a. *Phytognomonica Io. Baptiste Portae Neapolitani, Octo Libris Contenta*. Rouen: Oiannes Bertelin.
Della Porta, Giovan Battista. 1650b. *Magiae Naturalis. Libri Viginti*. Rouen: Oiannes Bertelin.
Delle Donne, Fulvio. 2024. Petrus de Ebulo. De Rebus Siculis Carmen, Edizione Critica. Basilicata University Press. Available online: https://web.unibas.it/bup/evt2/pde/index.html#/imgTxt?d=text_Carmen&p=frontespizio&s=intro&e=interpretative&ce=critical (accessed on 15 April 2024).
Eusko Ikaskuntza. 2014. Palacio Real de Olite. Available online: https://aunamendi.eusko-ikaskuntza.eus/es/palacio-real-de-olite/ar-154576/# (accessed on 15 April 2024).
FAO. 2022. The Food and Agriculture Organization. FAOSTAT. Available online: https://www.fao.org/faostat/ (accessed on 15 April 2024).
Fernández, Joaquín, and Ignacio González. 1991. *A propósito de la Agricultura de Jardines de Gregorio de los Ríos*. Madrid: Real Jardín Botánico and Ayuntamiento de Madrid.
Ferrari, Giovanni Battista. 1646. *Hesperides sive de Malorum Aureorum cultura et usu. Libri Quatuor*. Rome: Sumptibus Hermanni Scheus.
Fleming, Donald. 2024. Hesiod in Anthology of Classical Myth. Available online: https://users.pfw.edu/flemingd/Hesiod%20Theogony.pdf (accessed on 15 April 2024).
Freedberg, David A. 1992. Ferrari on the Classification of Oranges and Lemons. In *Documentary Culture: Florence and Rome from Grand-Duke Ferdinand I to Pope Alexander VII; Papers from a Colloquium Held at the Villa Spelman, Florence, 1990 (Villa Spelman Colloquia 3)*. Edited by Elizabeth Cropper, Giovanna Perini and Francesco Solinas. Bologna: Nuova Alfa Editoriale, pp. 287–306. Available online: https://arthistory.columbia.edu/sites/default/files/content/faculty/pdfs/freedberg/Ferrari-on-the-Classification.pdf (accessed on 15 April 2024).
Freedberg, David A. 1996. Ferrari and the pregnant lemons of Pietrasanta. In *Il Giardino delle Esperidi: Gli agrumi nella storia, nella letteratura e nell'arte*. Edited by Alessandro Tagliolini and Margherita Azzi Visentini. Florence: Edifir, pp. 41–58. Available online: https://arthistory.columbia.edu/sites/default/files/content/faculty/pdfs/freedberg/Ferrari-Pregnant-Lemons.pdf (accessed on 15 April 2024).
Freedberg, David A. 2008. Gli agrumi di Giovanni Battista Ferrari. In *Miti, Arte e Scienza nella Pomologia Italiana*. Edited by Enrico Baldini. Rome: Consiglio Nazionale di Ricerca, pp. 125–56. Available online: https://arthistory.columbia.edu/sites/default/files/content/faculty/pdfs/freedberg/Ferrari-on-the-Classification.pdf (accessed on 15 April 2024).
Frère, Dominique, Elisabeth Dodinet, and Nicolas Garnier. 2012. L'étude interdisciplinaire des parfums anciens au prisme de l'archéologie, la chimie et la botanique: L'exemple de contenus de vases en verre sur noyau d'argile (Sardaigne, VIe-IVe siècle av. J.-C.). *ArcheoSciences* 36: 47–59. [CrossRef]
Gallesio, Georges. 1840. *Traité des Citrus*. Paris: Louis Pantin.
García-Gómez, Emilio. 1978. *El libro de las Banderas de los Campeones de Ibn Saʿīd al-Magribī*. Barcelona: Seix Barral.
García-Sánchez, Expiración. 1995. Cultivos y espacios agrícolas irrigados en Al-Andalus. In Cara-Barrionuevo, Lorenzo, Malpica-Cuello, Antonio. In *Agricultura y Regadío en Al-Andalus, síntesis y Problemas: Actas del Coloquio, Almería, 9 y 10 de junio de 1995*. Almería: Instituto de Estudios Almerienses, pp. 17–38.
García-Sánchez, Expiración, Julia Maria Carabaza, and Jacinto Esteban Hernández-Bermejo. 2021. *Flora Agrícola y Forestal de al-Andalus, Vol. 2. Especies leñosas*; Madrid: Ministerio de Agricultura, Pesca y Alimentación.
Gaztelu, Rafael. 1883. Historia de un naranjo. *Revista Euskara (Pamplona)* 6: 362–71.
Giner-Aliño, Bernardo. 1893. *Tratado Completo del Naranjo*. Valencia: Librería de Pascual Aguilar.
Glosbe. 2024. Glosbe Diccionario (Árabe Egipcio). Available online: https://glosbe.com/ (accessed on 1 May 2024).
Goldschmidt, Eliezer E. 2023. 'Fruit of the Goodly Trees': The Talmudic Discourse on the Etrog Citron. In *The Citron Compendium, The Citron (Etrog) Citrus medica L.: Science and Tradition*. Edited by Eliezer E. Goldschmidt and Moshe Bar-Joseph. Cham: Springer, pp. 387–403. [CrossRef]
Gual-Camarena, Miguel. 2024. Naranjas. Available online: https://www.um.es/lexico-comercio-medieval/index.php/v/lexico/23939/naranjas (accessed on 1 May 2024).
Guerra, Francisco, and María del Carmen Sánchez-Téllez. 1984. *El libro de Medicinas Caseras de Fr. Blas de la Madre de Dios: Manila, 1611*. Madrid: Comisión Nacional del V Centenario. Ediciones Cultura Hispánica. Instituto de Cooperación Iberoamericana.
Hallamish, Moshe. 2023. The Etrog Citron in Rabbinic and Kabbalistic Literature. In *The Citron Compendium, The Citron (Etrog) Citrus medica L.: Science and Tradition*. Edited by Eliezer E. Goldschmidt and Moshe Bar-Joseph. Cham: Springer, pp. 441–61. [CrossRef]
Hamarneh, Sami Khalaf. 1978. Medicinal plants, therapy and ecology in Al-Ghazzi's book on agriculture. *Studies in the History of Medicine* 2: 223–63.
Harvard. 2024. Department of the Classics: Ancient Texts Resources. Available online: https://classics.fas.harvard.edu/ancient-text-resources (accessed on 15 April 2024).
Hernández-Bermejo, J. Esteban, and Expiración García-Sánchez. 1988. *Ibn al-ʿAwwām, Kitāb al-Filāḥa. Libro de Agricultura*; Edited by Josef Antonio Banqueri. 2 vols, Madrid: Ministerio de Agricultura, pp. 314–24.
Hort, Arthur F. 1916a. *Theophrastus, Enquiry into Plants: Books 1–5*. Loeb Classical Library. Cambridge: Harvard University Press.
Hort, Arthur F. 1916b. *Theophrastus, Enquiry into Plants: Books 6–9; Treatise on Odours; Concerning Weather Signs*. Loeb Classical Library. Cambridge: Harvard University Press.
Ibn Khafāja, Abu Ishaq Ibrahim. 1986. *Dīwān*. Beirut: Al-Bustāni.

IPGRI (International Plant Genetic Resources Institute). 1999. Descriptors for Citrus (*Citrus* spp.). International Plant Genetic Resources Institute. Available online: https://cgspace.cgiar.org/server/api/core/bitstreams/7c4ace4d-ee3a-4e4a-b7d1-b1218898ebf4/content (accessed on 25 April 2024).
Isaac, Erich. 1959a. Influence of Religion on the Spread of Citrus. *Science, New Series* 129: 179–86. [CrossRef] [PubMed]
Isaac, Erich. 1959b. The Citron in the Mediterranean: A Study in Religious Influences. *Economic Geography* 35: 71–78. [CrossRef]
Kern, Edith G. 1951. The Gardens in the Decameron Cornice. *Proceedings Modern Language Association* 66: 505–23. [CrossRef]
Klein, Joshua D., Yonit Raz Shalev, Shlomo Cohen, and Elazar Fallik. 2016. Postharvest handling of "etrog" citron (*Citrus medica*, L.) fruit. *Israel Journal of Plant Sciences* 63: 64–75. [CrossRef]
Laca, Luis R. 2003. The Introduction of Cultivated Citrus to Europe via northern Africa and the Iberian Peninsula. *Economic Botany* 57: 502–14. [CrossRef]
Langgut, Dafna. 2015. Prestigious fruit trees in ancient Israel: First palynological evidence for growing Juglans regia and Citrus medica. *Israel Journal of Plant Sciences* 62: 98–110. [CrossRef]
Langgut, Dafna. 2017. The history of Citrus medica (citron) in the Near East: Botanical remains and ancient art and texts. In *AGRUMED: Archaeology and History of Citrus Fruit in the Mediterranean: Acclimatization, Diversifications, Uses [Online]*. Edited by Veronique Zech-Mattern and Girolamo Fiorentino. Naples: Publications du Centre Jean Bérard, ISBN 9782918887775.
López-Gómez, Antonio. 1957. Evolución agraria de la Plana de Castellón. *Estudios Geográficos* 18: 309–60.
Luengo, Carmen. 2024. *Jardines Históricos de Madrid*. Madrid: Artelibro Editorial. Available online: https://jardineshistoricos.es/jardines-historicos-de-madrid/ (accessed on 15 April 2024).
Luro, François, Franck Curk, Yann Froelicher, and Patrick Ollitrault. 2017. Recent Insights on Citrus Diversity and Phylogeny. In *AGRUMED: Archaeology and History of Citrus Fruit in the Mediterranean: Acclimatization, Diversifications, Uses [Online]*. Naples: Publications du Centre Jean Bérard, ISBN 9782918887775.
Masseti, Marco. 2009. In the gardens of Norman Palermo, Sicily (twelfth century A.D.). *Anthropozoologica* 44: 7–34. [CrossRef]
Monardes, Nicolás. 1551. *De secanda vena in pleuritide inter Graecos et Arabes concordia Item eiusdem De rosa et partibus eius, De succi rosarum temperatura, nec non de rosis Persicis, quas Alexandrinas vocant*. Antwerp: Ioannem Richardum in Sole Aureo.
Navaggero, Andrés. 1983. *Viaje por España: (1524–1526)*. Translated by Antonio María Fabie. Madrid: Turner.
Navarro-Palazón, Julio, and Fidel Garrido. 2018. Peri-urban landscape in Marrakesh: The Menara and other recreational estates (12th-20th centuries). In *Almunias. Las fincas de las élites en el Occidente Islámico: Poder, solaz y Producción*; Edited by Julio Navarro-Palazón and Carmen Trillo. Granada: CSIC, pp. 195–284.
Navarro-Palazón, Julio, and José Miguel Puerta. 2018. The orchards of Marrakesh in written sources: Bustān, buḥayra, ŷanna, rawḍ and agdāl (12th–20th centuries). In *Almunias. Las fincas de las élites en el Occidente Islámico: Poder, solaz y Producción*; Edited by Julio Navarro-Palazón and Carmen Trillo. Granada: CSIC, pp. 285–305.
Navarro-Palazón, Julio, Fidel Garrido-Carretero, and José Manuel Torres-Carbonell. 2014. El Agdal de Marrakech. Hidráulica y Producción de Una Finca Real (ss. XII-XX). In *Phicaria: Uso y Gestión de Recursos Naturales en Medios Semiáridos del Ámbito Mediterráneo*. Mazarrón: Universidad Popular de Mazarrón, pp. 54–115.
Navarro-Palazón, Julio, Fidel Garrido, and Íñigo Almel. 2017. The Agdal of Marrakesh (Twelfth to Twentieth Centuries): An Agricultural Space for Caliphs and Sultans. Part I: History. In *Muqarnas, An Annual on the Visual Cultures, of the Islamic World*. Edited by Gólru Necipoğlu and Maria J. Metzler. Leiden and Boston: J. Brill, vol. 34, pp. 24–32.
Navarro-Palazón, Julio, Fidel Garrido, and Íñigo Almel. 2018. The Agdal of Marrakesh (Twelfth to Twentieth Centuries): An Agricultural Space for Caliphs and Sultans. Part II: Hydraulics, Architecture and Agriculture. In *Muqarnas, An Annual on the Visual Cultures, of the Islamic World*. Edited by Gulru Necipoğlu and Maria J. Metzler. Leiden and Boston: J. Brill, vol. 35, pp. 1–64.
Navarro-Palazón, Julio, Fidel Garrido, José Manuel Torres, and Hamid Triki. 2013. Agua, arquitectura y poder en una capital del islam: La finca real del Agdal de Marrakech (ss. XII-XX)—Water, architecture and power in an Islamic capital: The royal country state of the Agdal of Marrakech (12th–20th Centuries). *Arqueología de la Arquitectura* 10: e007. [CrossRef]
Noguera, José Miguel. 2001. El Casón de Jumilla Líneas de Estudio para un Proyecto Integral de Investigación Histórico-Arqueológica de un Mausoleo Tardorromano. Available online: https://www.um.es/antiguedadycristianismo/martyrium/wp-content/uploads/2023/04/20CASON.pdf (accessed on 15 April 2024).
Observatory of Economic Complexity. 2022. The Latest Trade Data of Citrus. Available online: https://oec.world/en/profile/hs/citrus (accessed on 15 April 2024).
Ollitrault, Patrick, Frank Curk, and Robert Krueger. 2020. Citrus taxonomy in Manuel Talon. In *The Genus Citrus*. Edited by Marco Caruso and Fred Gmitter. Cambridge: Woodhead Publishing, pp. 57–81. [CrossRef]
Ortiz-Cordero, Rafael, and Rafael Enrique Hidalgo-Fernández. 2017. 3D Photogrammetry, capacity, filling time and water flow simulation of Cordoba's Mosque-Cathedral Islamic cistern. *Digital Applications in Archaeology and Cultural Heritage* 4: 39–48. [CrossRef]
Pagnoux, Clémence, Alessandra Celant, Sylvie Coubray, Girolamo Fiorentino, and Véronique Zech-Matterne. 2013. The introduction of Citrus to Italy, with reference to the identification problems of seed remains. *Vegetation History and Archaeobotany* 22: 421–38. [CrossRef]
Pardo Bazán, Emilia. 1881. *Un Viaje de Novios*. Madrid: Editorial Pueyo.
PARES. 2024. Albaranorum et Curie. Archivo de la Corona de Aragón, ACA, CANCILLERÍA, Registros, NÚM.71. Available online: https://pares.mcu.es/ParesBusquedas20/catalogo/show/4327978 (accessed on 15 April 2024).

Pasquarella, Carmelo, and Michele Borgongino. 2005. I dipinti della Sala Pompeiana nella Reggia di Portici. In *Cibi e Sapori a Pompei e Dintorni*. Edited by Stefani Grete. Pompei: Edizioni Flavius, pp. 156–74.
Patrimonio. 2024. Cantigas de Santa María, Códice Rico. Alfonso X, Rey de Castilla. Available online: https://www.patrimonionacional.es/colecciones-reales/cantigas-de-santa-maria-codice-rico (accessed on 15 April 2024).
Pavesi, Francesco. 2023. *Gli Agrumi dei Medici*. Vignate: Rotomail.
Piepmeier, Mary. 2018. The Appeal of Lemons: Appearance and Meaning in Mid Seventeenth-Century Dutch Paintings. Ph.D. dissertation, The University of North Carolina at Chapel Hill, Chapel Hill, NC, USA.
Pinon, Dominique. 2018. Château-Gaillard (Amboise) et les Orangers de Pacello da Mercogliano: Un Document Inédit. Available online: https://www.academia.edu/44478293/Ch%C3%A2teau_Gaillard_Amboise_et_les_orangers_de_Pacello_da_Mercogliano_un_document_in%C3%A9dit (accessed on 15 April 2024).
Pontano, Giovanni Gioviano. 2024a. Pontano De Hortis Hesperidium (1). Available online: https://mizar.unive.it/poetiditalia/public/testo/testo?codice=PONTANO%7Chesp%7C001 (accessed on 15 April 2024).
Pontano, Giovanni Gioviano. 2024b. Pontano De Hortis Hesperidium (2). Available online: https://mizar.unive.it/poetiditalia/public/testo/testo?codice=PONTANO%7Chesp%7C002 (accessed on 15 April 2024).
POWO. 2024. Plants of the World Online. Available online: https://powo.science.kew.org/ (accessed on 15 April 2024).
Racioppi, Pier Paolo. 2024a. "Zisa" in Discover Islamic Art, Museum with No Frontiers, 2024. Available online: https://islamicart.museumwnf.org/database_item.php?id=monument;ISL;it;Mon01;1;es (accessed on 30 April 2024).
Racioppi, Pier Paolo. 2024b. Mosaici Della Sala di Ruggero nel Palazzo Reale (o dei Normanni). Available online: https://islamicart.museumwnf.org/database_item.php?id=monument;ISL;it;Mon01;17;it&cp (accessed on 30 April 2024).
Rackham, Harris. 1945. *Pliny, Natural History, Volume IV: Books 12–16*. Loeb Classical Library. Cambridge: Harvard University Press.
RAE. 2024. Banco de Datos CORDE. Available online: https://www.rae.es/banco-de-datos/corde (accessed on 15 April 2024).
Raimondo, Francesco Maria, Luigi Cornara, Pietro Mazzola, and Antonio Smeriglio. 2015. Le lumie di Sicilia: Note Storiche e botaniche. *Quaderni di Botanica Ambientale e Applicata* 26: 43–50. Available online: https://www.centroplantapalermo.org/quaderni/26_043-050.pdf (accessed on 15 April 2024).
Reina, Manuel-Francisco. 2007. *Antología de la Poesía Andalusí*. Madrid: Edaf.
Rigg, John M. 1930. *The Decameron of Giovanni Bocaccio*. Translated by John M. Rigg. London: J.M. Dent & Sons, vol. 1, Available online: http://dbooks.bodleian.ox.ac.uk/books/PDFs/502235914.pdf (accessed on 16 April 2024).
Ríos, Segundo, Vanessa Martínez-Francés, Pedro Moya, and Roberto Poyatos. 2024. La colección de lirios (Iris L. Iridaceae) de la Estación Biológica de Torretes—Jardín Botánico de la Universidad de Alicante: Iridario "Christine Lomer". *Bouteloua* 37: 42–60.
Risso, Antoine, and Pierre Antoine Poiteau. 1818–1822. *Histoire Naturelle des Orangers*. Paris: Impr. de Mme Hérissant Le Doux. Available online: https://gallica.bnf.fr/ark:/12148/bpt6k1512210b# (accessed on 16 April 2024).
Rivera, Diego, Antonio Bermudez, Concepción Obón, Francisco Alcaraz, Segundo Ríos, Jorge Sánchez-Balibrea, P. Pablo Ferrer-Gallego, and Robert Krueger. 2022. Analysis of 'Marrakesh limetta' (Citrus × *limon* var. *limetta* (Risso) Ollitrault, Curk & R. Krueger) horticultural history and relationships with limes and lemons. *Scientia Horticulturae* 293: 110688. [CrossRef]
Rivera, Diego, Concepción Obón, Francisco Alcaraz, Emilio Laguna, and Dennis Johnson. 2019. Date-palm (*Phoenix*, Arecaceae) iconography in coins from the Mediterranean and West Asia (485 BC–1189 AD). *Journal of Cultural Heritage* 37: 199–214. [CrossRef]
Rivera, Diego, Concepción Obón, Segundo Ríos, Caridad Selma, Francisco Méndez, Alonso Verde, and Francisco Cano. 1998. *Las Variedades Tradicionales de Frutales de la Cuenca del Río Segura. Catálogo Etnobotánico. Cítricos, Frutos Carnosos y Vides*. Murcia: Diego Marín.
Rivera, Diego, Javier Abellán, Diego-José Rivera-Obón, José Antonio Palazón, Manuel Martínez-Rico, Francisco Alcaraz, Dennis Johnson, Concepción Obón, and Pedro A. Sosa. 2023. Expanding dendrochronology to palms: A Bayesian approach to the visual estimate of a palm tree age in urban and natural spaces. *Current Plant Biology* 35: 100301. [CrossRef]
Rodrigues, Ana Margarida Duarte. 2017. The Role of Portuguese Gardens in the Development of Horticultural and Botanical Expertise on Oranges. *Journal of Early Modern Studies* 6: 69–89. [CrossRef]
Rodrigues, Ana Margarida Duarte. 2023. Early modern water-saving strategies for citrus growing in Greater Spain: Theory versus Practice. In *Pragmatismo e Ilusión: El Agua y la Gestión del Espacio y Territorio en Aranjuez y otros Sitios Cortesanos (Siglos XVI-XIX)*. Edited by Félix Labrador Arroyo and Magdalena Merlos Romero. Madrid: Sílex Universidad/Universidad Rey Juan Carlos, pp. 27–54.
Ruas, Marie-Pierre, Perrine Mane, Carole Puig, Charlotte Hallavant, Bénédicte Pradat, Mohamed Ouerfelli, Jérôme Ros, Danièle Alexandre-Bidon, and Aline Durand. 2015. Regard pluriel sur les plantes de l'héritage arabo-islamique en France médiévale. In *Héritages Arabo-Islamiques dans l'Europe Méditerranéenne*. Edited by Richarte Catherine, Gayraud Roland-Pierre et Poisson and Jean-Michel. Paris: La Découverte-INRAP, pp. 347–76. Available online: https://shs.hal.science/halshs-01570480/document (accessed on 12 November 2024).
Ruas, Marie-Pierre, Perrine Mane, Charlotte Hallavant, and Michel Lemoine. 2017. Citrus Fruits in historical France: Written sources, iconographic and plant remains. In *AGRUMED: Archaeology and History of Citrus Fruit in the Mediterranean: Acclimatization, Diversifications, Uses [Online]*. Naples: Publications du Centre Jean Bérard, ISBN 9782918887775. Available online: https://books.openedition.org/pcjb/2243 (accessed on 16 April 2024).

Sánchez, Miguel. 1881. Historia Primitiva y Exacta del Monasterio del Escorial la más rica en Detalles de Cuantas se han Publicado/Escrita el siglo XVI por el Padre Fray José de Sigüenza. *Sevilla. Manuel Tello y García.* Available online: https://bibliotecafloridablanca.um.es/bibliotecafloridablanca/handle/11169/7078 (accessed on 16 April 2024).
Saunt, James. 1990. *Citrus Varieties of the World*. Norwich: Sinclair International Limited.
Savastano, Luigi Salvatore. 1883. Le Varietà degli Agrumi del Napoletano. Available online: https://babel.hathitrust.org/cgi/pt?id=uga1.32108005555506&seq=39 (accessed on 16 April 2024).
Simón, Elisa. 2020. Pinturas de la sala de los Reyes—La Alhambra, Granada. Available online: https://andalfarad.com/pinturas-de-la-sala-de-los-reyes-la-alhambra-granada/ (accessed on 16 April 2024).
Soriano, Jerónimo. 1598. *Libro de Experimentos Médicos, Fáciles y Verdaderos Recopilados de Grauissimos Autores por el Doctor Hieronymo Soriano*. Zaragoza: Juan Perez de Valdivielso.
Sottile, Francesco, Maria Beatrice Del Signore, and Ettore Barone. 2019. Ornacitrus: Citrus plants (*Citrus* spp.) as ornamentals. *Folia Horticulturae* 31: 239–51. [CrossRef]
Stampella, Pablo C., Gustavo Delucchi, Héctor A. Keller, and Julio A. Hurrell. 2014. Etnobotánica de *Citrus reticulata* (Rutaceae, Aurantioideae) naturalizada en la Argentina. *Bonplandia* 23: 151–62. [CrossRef]
Taburet-Delahaye, Élisabeth, and Béatrice de Chancel-Bardelot. 2018. *The Lady and the Unicorn*. Paris: Réunion des Musées Nationaux—Grand Palais.
Tasso, Torquato. 1822. *Gerusaleme Liberata di Torquato Tasso*. London: C. Corral. Available online: https://bdh-rd.bne.es/viewer.vm?id=0000106004 (accessed on 16 April 2024).
Tilly, Georges. 2020. Un Manifeste Posthume de l'humanisme Aragonais: Le De hortis Hesperidum de Giovanni Pontano. Ph.D. thesis, Université de Rouen Normandie, Rouen, France. Available online: https://theses.hal.science/tel-03197923 (accessed on 12 November 2024).
Tintori, Giorgio, and Sergio Tintori. 2000. *Gli Agrumi Ornamentali Consigli Dalla Tradizione dei Contadini Giardinieri*. Bologna: Calderini Edagricole—Oscar Tintori.
Tintori, Oscar. 2024. Oscar Tintori, Gli Agrumi in Toscana. Available online: https://www.oscartintori.it/ (accessed on 16 April 2024).
Tito-Rojo, José, and Manuel Casares-Porcel. 2011. *El Jardín Hispanomusulmán: Los Jardines de al-Andalus y su Herencia*. Granada: Editorial Universidad de Granada.
TLFi. 2024. *Trésor de la Langue Française Informatisé*. Nancy: ATILF—CNRS & Université de Lorraine. Available online: http://atilf.atilf.fr/tlf.htm (accessed on 16 April 2024).
Tolkowsky, S. 1938. *Hesperides a History of the Culture and Use of Citrus Fruits*. London: John Bale Sons & Cpurnou.
Trisciuzzi, Nicola. 2009. Scelta del materiale di propagazione. In *Quaderno Agrumicoltura*. Edited by Carmelo Memmone. Locorotondo: Centro di Ricerca e Sperimentazione in Agricoltura "Basile Caramia", pp. 27–40.
USDA. 2024a. William Saunders: A Monumental Figure in USDA. Available online: https://agresearchmag.ars.usda.gov/2013/sep/saunders/ (accessed on 16 April 2024).
USDA. 2024b. Citrus: World Markets and Trade. Available online: https://apps.fas.usda.gov/psdonline/circulars/citrus.pdf (accessed on 16 April 2024).
Valor, Magdalena. 2020. La Almunia de La Buhayra de Sevilla a través de la Crónica de Al-Salat. Available online: https://2020_Almunias._Tuetano20200402-27303-ein6k3-libre.pdf (accessed on 21 October 2024).
Vaticana. 2024. Manuscript—Vat.ar.368. Available online: https://digi.vatlib.it/view/MSS_Vat.ar.368 (accessed on 16 April 2024).
Vega-Carpio, Lope de. 1602. Arcadia, Prosas y Versos. Barcelona. Sebastián de Comellas. Available online: https://cervantes.bne.es/es/su-biblioteca/arcadia-prosas-y-versos (accessed on 16 April 2024).
Venuto, Antonino. 1516. *Notensis de Agricoltura opusculum*. Neaples: Sigismondo Mayer Alemanno.
VoDIM. 2024. Stazione Lessicografica VoDIM. Available online: https://www.stazionelessicografica.it/ (accessed on 16 April 2024).
Volkamer, Johan C. 1708. *Nürnbergische Hesperides*. Nüremberg: Johan Andreas Endters.
Wearn, James A., and David J. Mabberley. 2016. Citrus and Orangeries in Northern Europe. *Curtis's Botanical Magazine* 33: 94–107. [CrossRef]
Weber, Edgard. 1994. Jardins et Palais dans Le Coran et les Mille et Une Nuits. *Sharq Al-Andalus* 10–11: 65–81. [CrossRef]
Zytaruk, Maria. 2011. Cabinets of Curiosities and the Organization of Knowledge. *University of Toronto Quarterly* 80: 1–23. [CrossRef]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.