BIODIVERSITAS
Volume 25, Number 11, November 2024
Pages: 4462-4478

ISSN: 1412-033X
E-ISSN: 2085-4722
DOI: 10.13057/biodiv/d251145

Diversity and threats to trees and shrubs in the courtyards of the blessed Al-Aqsa Mosque in the city of Al-Quds (Jerusalem), Palestine

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Manuscript received: 4 October 2024. Revision accepted: 24 November 2024.

Abstract. *Abd Rabou AFN, El-Kichaoui AY, Radwan ES, Al-Balawi EJ, Abbas AA, Elkahlout KE, Al-Hali DI, Abd Rabou MA, Abd Rabou AA, Jadallah RI, Hussein KA, Abou Auda M, Hammad AAQI, Abd Rabou IA, Abd Rabou OA, Abd Rabou NF, Shafei AA, Fayyad NA, Dardona AW, Dardona ZW, Madkour FA, Madkour HA, Khalaf NA, Al-Agha MR. 2024. Diversity and threats to trees and shrubs in the courtyards of the blessed Al-Aqsa Mosque in the city of Al-Quds (Jerusalem), Palestine. Biodiversitas 25: 4462-4478.* The blessed Al-Aqsa Mosque in the city of Al-Quds (Jerusalem), Palestine, which extends over an area of 144,000 square meters, is of great importance to Palestinians, Arabs, and Muslims. Despite the many studies that have addressed the various features of the blessed Al-Aqsa Mosque, the vegetation cover has been rarely written about. This current descriptive study aims to enumerate the trees and shrubs that adorn the courtyards of the blessed Al-Aqsa Mosque. The study relied on continuous visits, observations, and discussions since 2020. A direct inventory of the trees and shrubs was conducted in terms of species and numbers, and they were classified according to the available guidebooks. Photographs were taken for documentation and verification purposes. The number of trees and shrubs in the courtyards of the blessed Al-Aqsa Mosque amounted to 1,042 trees and shrubs. The recorded trees and shrubs consisted of 30 species belonging to 20 families and 14 orders. Gymnosperms included 4 species (13.3%), while angiosperms included 26 species (86.7%). The European Olive (*Olea europea* L.) was the most widespread species with 550 individuals (52.78%), followed by the Evergreen Cypress (*Cupressus sempervirens* L.) with 274 individuals (26.29%), and the Aleppo or Jerusalem Pine (*Pinus halepensis* Mill.) with 85 individuals (8.16%). The number of recorded tree species amounted to 20 species (66.7%), while the number of shrub species amounted to 10 species (33.3%). Exotic trees or shrubs constituted 21 species (70.0%), while the rest (30.0%) were native. Threats to the trees and shrubs of Al-Aqsa Mosque included Israeli excavations under Al-Aqsa Mosque and its courtyards, Israel's use of some toxic and chemical materials to break up the soil and facilitate excavations, cutting down trees and shrubs for Israeli security purposes, burning trees and shrubs due to Israeli military actions, Israel's prevention of replanting or planting trees and shrubs, severe storms and strong winds, and diseases. If conditions permit, it is recommended to plant woody plant species that are compatible with the prevailing environmental and ecological conditions in Palestine, which add splendor to the courtyards of this great historical Islamic place in Palestine.

Keywords: Al-Aqsa Mosque, Al-Quds, European olive, evergreen cypress, exotic vs. native, Israeli excavations, Jerusalem, Palestine

INTRODUCTION

Despite its relatively small area, Palestine (27,000 km^2) is home to an important diversity of plant species. This comes due to its climate and soil diversities, terrain, and strategic geographical location at the meeting point of Asia, Africa, and Europe. Most of the vegetation cover in Palestine is located within the plants of the Mediterranean basin, and their number now exceeds 2,700 species, with the Compositae, Gramineae, Leguminaceae, Crucifera, Labiatae, and Liliaceae are most common families (Ali-Shtayeh and Jamous 2002). In the same context, Palestine is studded with both native and exotic woody plants, especially trees and shrubs, characterizing the green spaces, public and private parks and gardens, resorts, botanical gardens, governmental institutions, schools and universities, hospitals, zoos (zoological gardens), farms, orchards, cemeteries, roads and streets, and courtyards (Abbas 2016; Abd Rabou and Radwan 2017a; Abd Rabou 2018, et al. 2019).

Botanists commonly define a tree as a woody, single-stemmed plant that grows to a height of more than 3 meters. Shrubs are usually much smaller than trees. Gardeners consider any multi-stemmed plant less than 5-6 meters in height as a shrub and any plant above that, whether multi-stemmed or not, as a tree (Cheers 2008). In the context of garden, trees are by far the longest-lived plants, while shrubs are often used to fill in the spaces left under trees. Pruning is a very important maintenance method for both garden trees and shrubs in order to ensure the formation of healthy, well-shaped plants. Pruning maintains ventilation, which reduces fungal problems and allows light to infiltrate the center of shrubs and trees (Cheers 2008).

Vascular plants provide various benefits to people and the environment. Despite their beauty values, trees and shrubs could help improve the life and health status of inhabitants, serve as sites of physical activity, filter the atmosphere, remove pollutants, attenuate noise, cool temperatures, infiltrate storm water, replenish groundwater, and attract wildlife species; especially birds (Hartig 2008; Barton and Pretty 2010; Sister et al. 2010; Escobedo et al. 2011; Roy et al. 2012). Fruit trees and shrubs can provide food for both humans and wildlife (Abd Rabou 2005, 2018 and 2019).

During the past three decades, considerable work was paid to floristic species as well as native and exotic woody plants prevailing in the natural, semi-natural, rural, and urban ecosystems of the West Bank and the Gaza Strip of Palestine (Danin 1992; Al-Sheikh et al. 2000; Ghattas et al. 2002; Abd Rabou 2005, et al. 2008, 2018; Mohammad 2005; Abou Auda et al. 2009, 2023; Hinnawi 2010; Alkowni and Sawalha 2012; Abbas 2016; Al-Sheikh and Mahassneh 2016; Dardona 2016, 2018; Al-Quds Society for Developing Al-Mawasi 2017; Ali-Shtayeh and Jamous 2018; Ighbareyeh et al. 2017, et al. 2019; Ighbareyeh and Carmona 2018; Al-Sheikh 2019; Atalla and Dardona 2019; Nazzal 2019; Al-Sheikh and Qumsiyeh 2021; Ali-Shtayeh et al. 2022; Qumsiyeh and Al-Sheikh 2023). Despite the diversity of previous studies that focused on surveying natural plants, native and exotic trees, and shrubs in many ecosystems in Palestine, it seems that they have not been sufficiently studied or surveyed in the courtyard of the blessed Al-Aqsa Mosque in Al-Quds (Jerusalem), Palestine. This mosque is of great importance to Palestinians, Arabs, and Muslims from religious, spiritual, historical, and cultural aspects, although it has been languishing, like the Palestinian territories, for a long time under the brutal Israeli occupation.

The excavations by Israel in Al-Aqsa Mosque in Al-Quds have impacted the vegetation previously occurring around the mosque, putting pressures to the plant diversity in the area. Such excavations cause the destruction of the deep roots of perennial trees and shrubs, and then their death and fall. Hence, the current study aims to enumerate the trees and shrubs that prevail in the courtyard of Al-Aqsa Mosque in Al-Quds (Jerusalem), Palestine. Such trees and shrubs, along with their faunistic components, are known to add more beauty to the environment of this historical, religious, and spiritual place in Palestine. The importance of the current work comes from the fact that it seems to be the first to deal with the woody plants in this specific spot of the world.

MATERIALS AND METHODS

Study area

Al-Quds (Jerusalem)

The city of Al-Quds (Bait Al-Maqdis or Al-Quds Al-Sharif), which is the capital of Palestine, is one of the most important civilized and holy cities in the world. The city has been known since its foundation by many names: Yabous, City of David (Daoud), Ursalam, Ilya, and Jerusalem (Bazian 2007). The city of Al-Quds is the first of the two Qiblas and the third of the Two Holy Mosques, the place where the Prophet Muhammad (may God bless him and grant him peace) and the cradle of the Messiah (peace be upon him). The importance of its geographical location distinguishes the city of Al-Quds, as Al-Quds is located in the center of Palestine, specifically on one of the rocky hills, and there is a group of valleys around it (Figure 1). The area of Al-Quds or Jerusalem is divided into two main parts: (i) East Jerusalem or the Old City, which contains a group of religious monuments, the most important of which are the Al-Aqsa Mosque and the Church of the Holy Sepulcher: (ii) West Jerusalem, or the New City, which includes many modern places. Al-Quds has an approximate height of 775 m above sea level. The Mamluks and the Ottomans succeeded in ruling Jerusalem. Then British colonialism came, which controlled the city until 1948. Then, the British Balfour Declaration led to an increase in the immigration of Jews to Jerusalem and all the Palestinian lands. Since 1969, Jerusalem has been under Zionist occupation to this day. The city of Al-Quds (Jerusalem) and the blessed Al-Aqsa Mosque have suffered and are still suffering from the oppression and terror of the Israeli occupation, especially the excavations carried out by the Jews under the Al-Aqsa Mosque, which threaten the entire mosque and its courtyards, which extend over an area of 144,000 square meters (144 dunums).

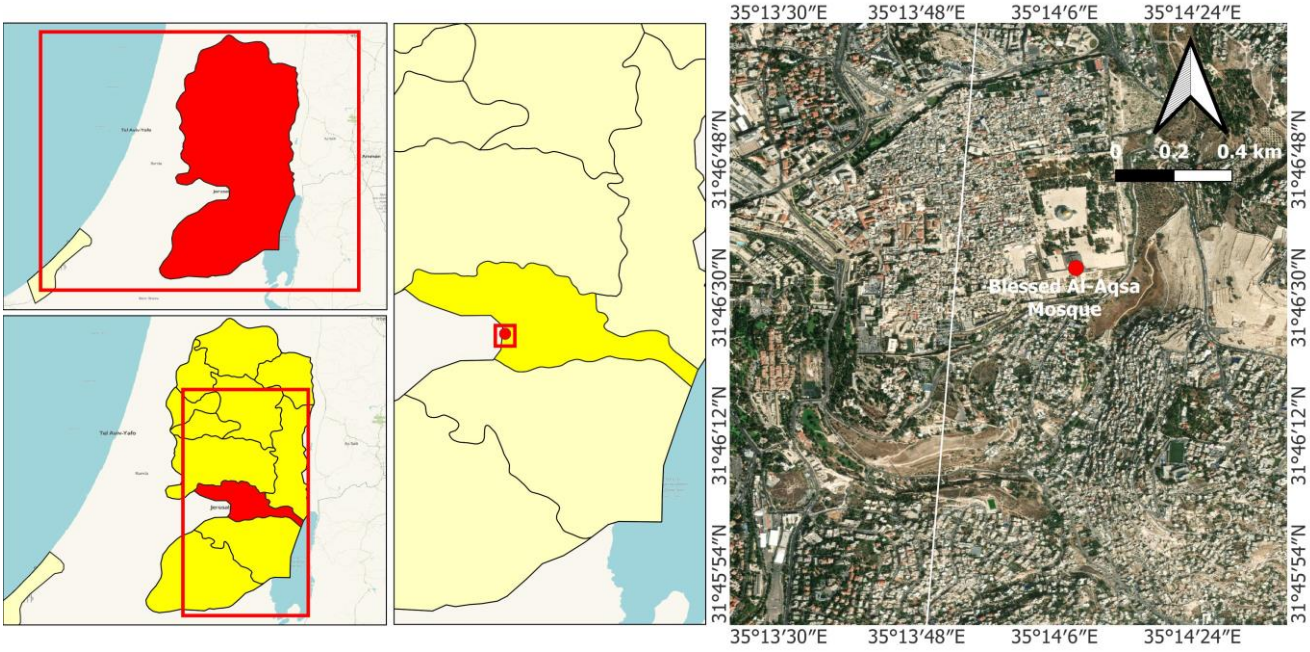

Figure 1. A map of Palestine showing the position of the Blessed Al-Aqsa Mosque in Al-Quds (Jerusalem), Palestine areal scene with vegetation position in the courtyard and the scene during praying time

The blessed Al-Aqsa Mosque

Al-Aqsa Mosque (Figure 1) is one of the largest and most beautiful mosques in the world. It is also one of the three mosques that Muslims travel to and is considered the first of the two Qiblas in Islam. It is located inside the Old City of Al-Quds in Palestine. It is the entire area surrounded by the fence. The area of Al-Aqsa Mosque is approximately 144,000 square meters (144 dunums) and includes the Dome of the Rock, Al-Qibli Mosque, Al-Marwani Mosque, Bab Al-Rahma Mosque, and several other landmarks, amounting to 200 landmarks. Al-Aqsa Mosque is located on a small plateau called the "Moorea Plateau,", and the rock is the highest point in it, and it is located in its heart. The courtyards of Al-Aqsa Mosque are adorned with many species of fruiting and non-fruiting trees and shrubs, as well as countless species of herbaceous plants. The vegetation cover in the courtyards of Al-Aqsa Mosque provides great economic, cultural, and environmental services, as it attracts many elements of biodiversity, especially singing birds that adorn the place. The area of Al-Aqsa Mosque occupies about one-sixth of the area of the Old City of Al-Quds. Its shape is polygon or semi-rectangular (Figure 1); the length of its western side is 491 meters, its eastern side is 462 meters, its northern side is 310 meters, and its southern side is 281 meters (Al-Jazeera.net 2022).

It is worth mentioning that Al-Aqsa Mosque is mentioned at the beginning of Surat Al-Isra in the Holy Quran as follows: "Holy is He Who carried His servant by night from the Holy Mosque (in Makkah) to the farther Mosque (in Jerusalem) whose surroundings We have blessed that We might show him some of Our Signs Indeed He alone is All-Hearing, All-Seeing" (17:1) (سُبْحَانَ الَّذِى أَسْرَى بِعَبْدِهِ لَيْلاً مِنَ الْمَسْجِدِ الْحَرَامِ إِلَى الْمَسْجِدِ الأَقْصَى الَّذِى بَارَكْنَا حَوْلَهُ لِنُرِيَهُ مِنْ آيَاتِنَا إِنَّهُ هُو السَّمِيعُ الْبَصِيرُ).

Over the years, Al-Aqsa Mosque has been subjected to incursions by extremist Israeli settlers, with the protection of the Israeli police forces, without which a settler would not have been able to approach Al-Aqsa Mosque. These settlers perform religious rites and raise Israeli flags in order to provoke the feelings of Palestinian and non-Palestinian Muslims. Al-Mourabitoun and the Palestinian resistance fighters in the Al-Aqsa Mosque and its courtyards are subjected to abuse, beatings, and killing. Over the decades, many Palestinians have been martyred, and many have been wounded and arrested by the Israeli police, army, and border guards armed with the most powerful and finest firearms, rubber-coated iron bullets, stun grenades, and tear gas grenades. The intensity of the Israeli incursions in recent years has increased in an effort to impose the so-called spatiotemporal policy of dividing Al-Aqsa Mosque in light of a shameful global, Arab and Islamic silence and in light of the rush of some Arab and Islamic regimes supported and encouraged by the United States to normalize with Israel under the banner of "Abraham Agreements".

Data collection procedure

The current descriptive study relied on continuous visits and observations since 2020 of the species of trees and shrubs that are common in the courtyards and alleys of the blessed Al-Aqsa Mosque by specialists in botanical sciences who are interested in documenting the wooden plant features in the place. Some species that were burnt, uprooted, dried, or died due to Israeli excavations have been recorded over the past years. During the study, a direct enumeration of the target species, native or exotic, was carried out and classified scientifically according to the guidebooks (Karim and Quraan 1986; Al-Eisawi 1998; Madi 2001; Ali-Shtayeh et al. 2003; Abu Ayyash et al. 2007; Cheers 2008; Supreme Commission

for the Development of Riyadh City 2014). During the study phases, many Israeli violations of the vegetation cover in the courtyards of Al-Aqsa Mosque were also observed, as well as many meetings and discussions with worshipers, workers, and those interested in Al-Aqsa Mosque to identify the threats and dangers facing the species of trees and shrubs.

Photography and data analysis

During the study period, many photographs of trees and shrubs in the courtyards of Al-Aqsa Mosque were taken for documentation and confirmation purposes. However, some photos were taken from websites and the media. Graphs were plotted using Microsoft Excel 2010.

RESULTS AND DISCUSSION

Species diversity and abundance of trees and shrubs in the courtyards of Al-Aqsa Mosque

The current survey showed that the courtyards of the Blessed Al-Aqsa Mosque in Al-Quds (Jerusalem) are home to a variety of ornamental, horticultural, and agricultural tree and shrub species. A total number of 1,042 trees and shrubs belonging to the Gymnosperms and Angiosperms plant groups was identified and recorded. The recorded trees and shrubs were composed of 30 species belonging to 20 families and 14 orders (Table 1). The Gymnosperms (conifers or naked-seeded plants) included 4 species (13.3%) only, while the Angiosperms (flowering plants) included 26 species (86.7%), of which the monocots were 2 species and the dicots were 24 species (Figure 2). Table 1 shows that the Rosales was the biggest order and comprised 5 (16.7%) of the recorded species. It was followed by Pinales and Sapindales which comprised 4 (12.0%) for each. The order Lamiales was represented by 3 species (10.0%). The orders Arecales, Fabales, Myrtales, and Caryophyllales were represented by 2 species (6.7%) for each. The rest of the orders (Malvales, Asparagales, Gentianales, Laurales, and Ranunculales) were represented by only one species (3.3%) for each. As far as the families are concerned, Cupressaceae and Anacardiaceae were the biggest two families and each comprised 3 (10.0%) of the recorded species. The rest of the families listed, some of which consist of 2 species and some of one species.

Three species of trees and shrubs that were re-encoded in the courtyards of the Blessed Al-Aqsa Mosque consisted of 809 individuals (77.64%), more than three-fourths of the counted 1,042. European Olive (*Olea europea* L.) was, by far, the most common species among the trees and shrubs of Al-Aqsa Mosque. It consisted of 550 individuals (52.78%) of the individuals counted. This was followed by Evergreen Cypress (*Cupressus sempervirens* L.), comprising 274 individuals (26.29%), and Aleppo Pine or Jerusalem Pine (*Pinus halepensis* Mill.), comprising 85 individuals (8.16%). The numbers of remaining species of trees and shrubs (27 species) range from 1 to 20. It is worth mentioning that percentages were calculated for tree and shrub species with numbers exceeding 10, while percentages for species with numbers of 10 or less were not calculated and were replaced with an asterisk (*) (Table 1).

Despite some differences in the definitions of trees and shrubs, the one that depends on the number of stems has been adopted because it is the closest to understanding and scene. The number of tree species recorded at the courtyard of the Blessed Al-Aqsa Mosque was 20 (66.7%) out of 30, while the species of shrubs amounted to only 10 (33.3%) (Figure 3).

Trees and shrubs are usually divided according to whether they are native or exotic. In the courtyards of the Blessed Al-Aqsa Mosque, it was found that 21 species of trees and shrubs were exotic (70.0%), while the remaining number was native (30.0%) (Figure 4). A plant is considered native or indigenous when it grows naturally in a particular area without human intervention. It is said to be exotic or introduced or sometimes alien when, intentionally or otherwise, it is introduced into an area outside the area of normal distribution.

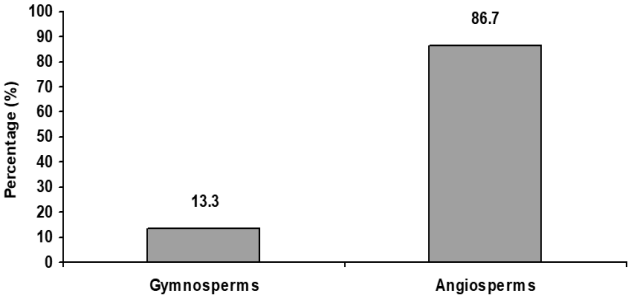

Figure 2. The percentage of Gymnosperms and Angiosperms (Monocot and Dicot) at the courtyards of the Blessed Al-Aqsa Mosque, Al-Quds, Palestine

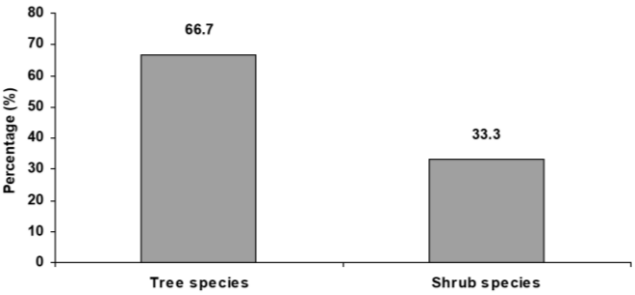

Figure 3. The percentage of tree and shrub species at the courtyards of the Blessed Al-Aqsa Mosque, Al-Quds, Palestine

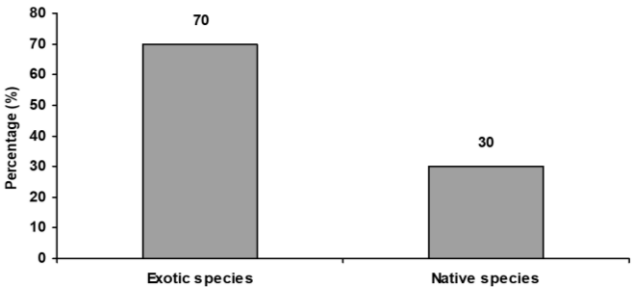

Figure 4. The percentage of exotic and native tree and shrub species at the courtyards of the Blessed Al-Aqsa Mosque, Al-Quds, Palestine

Table 1. List of tree and shrub species at the courtyards of Al-Aqsa Mosque, Palestine

Order	Family	Scientific or latin name	Common name	Arabic name	Tree or shrub	Native or Exotic	No. of individuals per species	% (#)
Gymnosperms (عاريات البذور)								
Pinales الصنوبريات	Pinaceae الصنوبرية	*Pinus halepensis* Mill.	Aleppo Pine (Jerusalem Pine)	الصنوبر الحلبي	Tree	Exotic	85	8.16
	Cupressaceae السروية	*Cupressus sempervirens* L.	Evergreen Cypress (Mediterranean Cypress)	السرو دائم الخضرة	Tree	Exotic	274	26.30
		Cupressus arizonica Greene	Arizona Cypress	سرو أريزونا	Tree	Exotic	2	*
		Platycladus orientalis (L.) Franco	Oriental Arbor-vitae	السرو القزمي (سرو الثويا المكوية)	Shrub	Exotic	8	*
Angiosperms - Monocot (كاسيات البذور - وحيدة الفلقة)								
Arecales الفوفليات (القبنيات)	Arecaceae الفوفلية (النخلية)	*Phoenix dactylifera* L.	Date Palm	نخيل البلح	Tree	Exotic	3	*
		Washingtonia robusta H.Wendl.	Mexican Fan Palm (Mexican Washingtonia)	نخيل واشنطونيا	Tree	Exotic	4	*
Angiosperms - Dicot (كاسيات البذور - ثنائية الفلقة)								
Fagales البلوطيات (الزانيّات)	Casuarinaceae الكزوارينية	*Casuarina equisetifolia* L.	Coastal She-oak (Australian Pine Tree)	الكازورينا	Tree	Exotic	20	1.91
Sapindales الصابونيات	Simaroubaceae السيماروبية	*Ailanthus altissima* (Mill.) Swingle	Tree of Heaven (Varnish Tree)	شجر السماء (الأيلنط الباسق)	Tree	Exotic	13	1.24
	Anacardiaceae البطمية (القلبية)	*Pistacia atlantica* Desf.	Atlantic Pistachio (Atlantic Terebinth or Persian Turpentine Tree)	البطم الأطلسي	Tree	Native	1 dead	*
		Schinus molle L.	California Peppertree	الفلفل الزائف	Tree	Exotic	2	*
		Schinus terebinthifolia Raddi	Brazilian Peppertree	الفلفل البرازيلي	Tree	Exotic	1	*
Lamiales الشفويات	Oleaceae الزيتونية	*Olea europea* L.	European Olive	الزيتون	Tree	Exotic	550	52.78
		Chrysojasminum fruticans (L.) Banfi	Common Yellow Jasmine	الياسمين الأصفر	Shrub	Native	11	1.06
	Verbenaceae اللُّوَيْزِيَّة	*Duranta erecta* L.	Golden Dewdrops	الدورانتا المنتصب	Shrub	Exotic	6	*
Rosales الورديات	Rosaceae الوردية	*Crataegus aronia* Decne., 1835	Spiny Hawthorn	الزعرور الشوكي	Tree	Native	1	*
		Prunus persica (L.) Stokes	Peach	الخوخ	Tree	Exotic	1	*
	Cannabaceae القنبية	*Celtis australis* L.	European Nettle Tree (Mediterranean Hackberry)	الميس الجنوبي (شجرة القراص الأوروبية)	Tree	Native	9	*
	Moraceae التوتية (الفرصادية)	*Morus alba* L.	White Mulberry (Silkworm Mulberry)	التوت الأبيض	Tree	Exotic	1	*
		Ficus carica L.	Common Fig	التين	Shrub	Native	1	*
Fabales الفوليات	Fabaceae (Leguminosae) الفُوليَّة (البقولية)	*Ceratonia siliqua* L.	Carob	الخروب (الخرنوب)	Tree	Native	8	*
		Gleditsia triacanthos L.	Honey Locust (Thorny Locust)	خروب العسل (غلاديشيا)	Tree	Exotic	2	*

Myrtales الآسيّات	Myrtaceae الآسيّة	*Eucalyptus camaldulensis* Denham	River Red Gum	الكينيا (الكافور)	Tree	Exotic	1	*
		Myrtus communis L.	Common Myrtle (True Myrtle)	الآس (الريحان)	Shrub	Native	5	*
Caryophyllales القرنفليات	Plumbaginaceae الرصاصية	*Plumbago auriculata* Lam.	Blue Plumbago (Cape Plumbago)	الياسمين الأزرق	Shrub	Exotic	2	*
	Nyctaginaceae الشبّية (الليلية)	*Bougainvillea spectabilis* Willd.	Great Bougainvillea	الجهنمية (المجنونة)	Shrub	Exotic	3	*
Malvales الخبازيات	Malvaceae الخُبَّازيّة	*Brachychiton populneus* (Schott & Endl.) R.Br.	Kurrajong (Bottletree)	المليس (بودرة العفريت)	Tree	Exotic	7	*
Asparagales الهليونيات	Asparagaceae الهليونية	*Ruscus hypoglossum* L.	Spineless Butcher's-broom (Horse Tongue Lily)	السفندر تحتي الأوراق (السفندر لامع الظهر أو مكنسة الجزار)	Shrub	Exotic	12	1.15
Gentianales الجنطيانيات	Apocynaceae الدفلية	*Nerium oleander* L.	Oleander (Nerium)	الدفلة (الدفلي)	Shrub	Native	2	*
Laurales الغاريات	Lauraceae الغارية	*Laurus nobilis* L.	True Laurel	الغار (الرند)	Shrub	Native	4	*
Ranunculales الحوذانيات	Papaveraceae الخشخاشية	*Citrus ×aurantium* L.	Bitter Orange	الخشخاش	Tree	Exotic	3	*
Total							1042	100%

Note: #: An asterisk (*) indicates that the percentage of tree and shrub species with numbers of 10 or fewer is less than 1%

An overview of the tree and shrub species recorded in the courtyards of the blessed Al-Aqsa Mosque

Aleppo Pine or Jerusalem Pine (Pinus halepensis)

Aleppo Pine is native to the Mediterranean region. In Palestine, it was referred to as Jerusalem Pine. This pine tree is considered the third most common tree that occurs in the courtyards of the blessed Al-Aqsa Mosque, and its number is 85 individuals distributed within the borders of the Al-Aqsa Mosque. It is one of the old trees with a relatively wide trunk and is characterized by its needle-shaped leaves and narrow cones that may exceed 10 cm in length. The Aleppo Pine is monoecious in the sense that both male and female cones are present on the same tree. Cones come in many shapes, including long, round, or oval. The cones are green at first and turn brown with age. The wind spreads the seeds of Aleppo Pine to new places after the cones have ripened and opened. The Aleppo Pine is spread in large areas of Palestine, and for this reason, it is found in remarkable abundance in the courtyards of the blessed Al-Aqsa Mosque. Aleppo Pine is cultivated in Palestine as an ornamental and horticultural tree for its wood, as a windbreaker, and to prevent soil erosion, especially on dry slopes. Over the past two decades, several Aleppo Pine trees have collapsed and fallen from their strong vertical roots that strike deep in the soil in the courtyards of the blessed Al-Aqsa Mosque. The people of Al-Quds and the worshipers pointed out that there are advanced and undeclared Israeli excavations digging deep into the Al-Aqsa Mosque towards the Sabil Al-Kass, which is located in the middle of the courtyard. The excavations cause the weakening and decay of the soil, which results in the fall of perennial trees in the courtyards of the blessed Al-Aqsa Mosque.

Evergreen or Mediterranean Cypress (Cupressus sempervirens)

The Evergreen Cypress, known as the Mediterranean Cypress, is one of the most common trees in the courtyards of Al-Aqsa Mosque. The current study recorded 274 individuals from this perennial tree, and therefore, it is considered the second most abundant tree in the courtyards of Al-Aqsa Mosque. It represents nearly a quarter of the number of recorded trees. It can reach a height of 20-30 meters, and its distinctive feature is that its trunk is conical. The most common varieties found in Palestine are *C. s.* var. *horizantalis* (Mill.) Loudon and *C. s.* var. *pyramidalis* Nyman. The plant is considered an ornamental tree and is widely used as a hedge to protect fields from wind damage in Palestine. The trees are commonly grown in gardens and landscapes and may be found wild throughout vast areas in Palestine. The species has a long history of use in traditional medicine. Some of those interviewed during the study indicated, as indicated by some local studies, that the Evergreen Cypress has medicinal uses in Palestinian folklore. Some parts of the plant, especially leaves and cones, have been used as antiseptic, antidiarrhoeic, anthelminthic, antirheumatic, etc.

Arizona Cypress (Cupressus arizonica)

As the name of the tree suggests, it is an exotic, and only two of it have been recorded today in the courtyards of Al-Aqsa Mosque, despite what is known about its tolerance to heat and drought. In Palestine, these trees, as well as other vertical and horizontal Evergreen Cypress trees (*C. sempervirens*), are used as windbreaks, erosion resistance, and landscape trees. This evergreen coniferous tree may grow to tall heights exceeding 20 meters and has a conical or oval-conical crown. The trees bear small seed cones that are closed for many years, and they open only after the death of the branch bearing them.

Oriental Arbor-vitae (Platycladus orientalis)

The Oriental Arborvitae, or Chinese Thuja, is exotic, slow-growing, and resistant to drought. It is one of the rare shrubs found in the courtyards of Al-Aqsa Mosque, where 8 individuals were recently encountered. The shrub is an ornamental plant that adorns many gardens, parks, universities, institutions, and some streets of Palestine, and its height may reach above 10 meters. Most young plants are seen as shrubs, but they can be pruned into a small tree by removing the lower branches. The plant is distinguished by its erect and vertically arranged branches. The evergreen leaves are bright yellow and green when young and turn dark green as they mature. The Oriental Arborvitae is monoecious bearing both male and female cones 1.5-2.5 cm long.

Date Palm (Phoenix dactylifera)

The Date Palm is considered one of the most widespread trees in Palestine, and its number is estimated in millions, although there are only three individual trees in the courtyards of the blessed Al-Aqsa Mosque. A few years ago, one of the Date Palm trees near one of the stairs leading to the Dome of the Rock fell after it had been inclined for years. In fact, Date Palm trees may be up to 30 meters high. In Palestine, they grow slowly and mostly singly, but sometimes, a clump may grow with several stems from a single root system. The crown of Date Palm trees may extend up to about 10 meters, which is a shelter for many forms of wildlife, especially birds, to lean on it or sometimes build their nests on it. In the courtyards of the blessed Al-Aqsa Mosque, passerines, doves, pigeons, crows, and raptors were spotted on the crowns of Date Palms and other trees. Date Palm trees are dioecious in the sense that they are separated into males and females. Males are only valuable as pollinators, and females are fruit producers. One mature tree can produce 70-140 kilograms of dates in the harvest season, depending on the cultivar. It is worth mentioning that a large number of date cultivars and varieties are cultivated in Palestine, with the Berhi, Deglet Noor, and Medjool are just a few examples. The Red Palm Beetle (*Rhynchophorus ferrugineus* (A.G.Olivier, 1791)) represents a major pest and poses a significant threat to date production in the state.

Mexican Fan Palm or Mexican Washingtonia (Washingtonia robusta)

The Mexican Fan Palm (Mexican Washingtonia or Skyduster), which is one of the fastest-growing of all palm tree varieties, is grown as an ornamental tree in different parts of Palestine. It is commonly seen in streets, institutions, public gardens, parks, etc. The large size and

fast growth rate demand careful placement. Hence, the trees are not really suitable for gardens or small backyards. Conversely, these trees are especially good in landscapes or along roads and streets where they grow free-form to full, tall heights. There are only four evergreen Mexican Fan Palm trees in the courtyards of the blessed Al-Aqsa Mosque. These trees grow high there and may reach a height of 25 meters or more. The leaves have spiny petioles up to 1 meter long and a palmate-leaved fan up to 1 meter long. If not pruned off, dead leaves persist almost indefinitely. The trunk is thin and tapered, and the mature tree often has a diameter of more than 50 cm at the base, which gradually decreases towards the top.

Coastal She-oak or Australian Pine Tree (Casuarina equisetifolia)

The Coastal She-oak or Casuarina (as it is commonly called among the Palestinians) is an exotic evergreen tree that reaches very high heights that may exceed 30 meters, as can be seen in the courtyards of the blessed Al-Aqsa Mosque where there are 20 trees. The trees have thin, drooping branches resembling a horse's tail and bear small, scale-like leaves. In Palestine, they constitute a valuable source of wood and firewood and can be used as ornamental trees that grow in squares, cemeteries, and public gardens. These trees are known as monoecious, meaning that they produce both male and female flowers on the same tree. The fruit is an oval woody structure that outwardly resembles a pine cone.

Tree of Heaven or Varnish Tree (Ailanthus altissima)

The Tree of Heaven is a fast-growing, deciduous tree capable of growing to great heights in multiple regions in Palestine, of which 13 are present in the courtyards of the blessed Al-Aqsa Mosque. The plant emits a strong, unpleasant odor, especially from its flowers. As an exotic plant, it was introduced outside China decades ago as a horticultural and shade tree. Ease of cultivation, rapid growth, and lack of disease became major factors that made the tree popular when planning urban landscapes in Palestine and around the world. The problem with this tree is that, like other trees, its roots can damage sidewalks, sewers, and building foundations.

Atlantic Pistachio or Persian Turpentine Tree (Pistacia atlantica)

There are no living specimens of this tree in the courtyards of the blessed Al-Aqsa Mosque, and in fact, what is found is a dry, erect, standing trunk of a tree that died more than a decade ago. This remnant of the Atlantic Pistachio tree is located to the west of the Dome of the Rock Mosque. Some interested people and worshipers believe that several Atlantic Pistachio trees have been present for decades, but they have collapsed for some reason, and only the erect trunk of one of the trees of this species remains.

California Peppertree (Schinus molle)

California Peppertree, which has a lot of common names like Peruvian Peppertree, False Pepper, etc., is an evergreen tree that grows up to 15 meters. There are only two trees recorded in the courtyards of the blessed Al-Aqsa Mosque during the current study. The California Peppertree is grown in some areas of Palestine as an ornamental tree due to its beautiful shade, somewhat drooping branches, and attractive shriveled trunk. The leaves of the tree are pinnately compound, and the fruits, which are bright pink, are 5-7 mm in diameter. The male and female flowers are located on separate plants, meaning that the plant is dioecious. These flowers are small, white, and profusely borne in panicles at the ends of overhanging branches. This plant has nothing to do with Black Pepper (*Piper nigrum* L.), which comes from India and is used as a spice all over the world.

Brazilian Peppertree (Schinus terebinthifolia)

Brazilian Peppertree, which normally reaches a height of 7-10 meters, has many common names, including Rose Pepper, Broad-leaved Peppertree, and Christmasberry. There is only one tree recorded in the courtyards of the blessed Al-Aqsa Mosque during the current study. Despite this, the plant thrives in a variety of ecosystems and on some roads in Palestine. The leaves are alternate and pinnately compound. The plant is dioecious, with small white flowers borne profusely in axillary clusters. The fruits are slightly smaller than those of the former California Peppertree and are 4-5 mm in diameter. These fruits are borne in clusters that are green at first, becoming bright red when ripe.

European Olive (Olea europea)

The courtyards of the Blessed Al-Aqsa Mosque contain approximately 550 Olive trees (about 52.78% of the total number of 1,042 trees and shrubs of Al-Aqsa Mosque), some of which may have roots dating back thousands of years, and some of them before and after the Israeli occupation of Al-Aqsa Mosque in 1967. In fact, many Olive trees are thousands of years old and yet continue to produce olives. However, these trees were not spared from the futility of the Israeli occupation. Olive trees, as well as Evergreen Cypress and Aleppo Pine trees, are the most widespread and distributed among the rest of the woody plants in the courtyards of the blessed Al-Aqsa Mosque. The employees of the Department of Agriculture in the Al-Aqsa Directorate undertake afforestation, plowing the land, irrigation, and caring for Olive trees, among others. During the Olive picking season, the people of Al-Quds, including some school children, continue to pick olives from the trees of the blessed Al-Aqsa Mosque, in coordination with the Islamic Endowment Department in Jerusalem, where the latter collects the Olive crop and distributes it according to certain mechanisms that it operates annually. It is worth mentioning that olive oil is distributed annually to the low-income families of Al-Quds.

Common Yellow Jasmine (Chrysojasminum fruticans)

Common Yellow Jasmine is a small semi-evergreen shrub that rarely exceeds two meters in height and bears slightly fragrant yellow flowers. Many different species of Jasmine are grown as an ornamental plant in Palestinian

institutions, resorts, parks and gardens. This shrub prefers to grow in fertile, moist soil in full sun or even partial shade. During the current study, 11 bushes of this native Common Yellow Jasmine were recorded in the courtyards of the blessed Al-Aqsa Mosque, and because they are small bushes, they do not occupy a large space. Shrubs have an erect habit, green stems, and alternate green leaves consisting of narrow leaflets.

Golden Dewdrops (Duranta erecta)

The common names of Golden Dewdrop include Skyflower and Pigeon Berry. Although the shrub is widely cultivated as an ornamental plant in public gardens and roads in Palestine, the courtyards of the blessed Al-Aqsa Mosque shelter only six shrubs. Plant heights may reach several meters, as seen in the courtyards of Al-Aqsa Mosque and some streets of Palestinian towns. The beautiful flowers of the plant attract butterflies and Palestine sunbirds (*Cinnyris osea* (Bonaparte, 1856)) to feed on their nectar. Birds were also commonly seen feeding on the berries of the plant.

Spiny Hawthorn (Crataegus aronia)

Although there is one unique bush of the native Spiny Hawthorn in the courtyards of the blessed Al-Aqsa Mosque, it is a common, adaptable, and resistant shrub that grows in diverse habitats in Palestine. It is a shrub of low, dense, and spiny nature, bearing beautiful flowers and small, tasty yellow fruits. The white flowers of Spiny Hawthorn appear in March and April, and the delicious yellow spherical fruits ripen in October. These fruits are used in the treatment of some diseases such as diarrhea, sore throat, dizziness, high blood pressure, atherosclerosis, heart diseases, and others. The crown is dense and thorny, which is used by passerines for hiding and nesting.

Peach (Prunus persica)

Peach trees of various strains are commonly cultivated and grown in vast areas of Palestine and they usually grow in heights of up to several meters. The leaves of Peach are lanceolate and the fruit has yellow or white flesh, a delicate aroma, and the peel may be velvety or smooth depending on the strain. In fact, there are many varieties of peaches sold in the Palestinian markets, some of which have free stones and others that have clinging stones depending on the ease or difficulty of separating their flesh from the pit. Only one Peachtree was found planted in the courtyards of the blessed Al-Aqsa Mosque.

European Nettle Tree or Mediterranean Hackberry (Celtis australis)

The lifespan of the European Nettle Tree in the courtyards of Al-Aqsa Mosque seems to extend to hundreds or even thousands of years. Some of the nine trees currently recorded in the courtyards of the blessed Al-Aqsa Mosque are located on either side of the stairs leading from the courtyard to the world-famous Dome of the Rock. The European Nettle Tree is a high-growing tree that may reach a height of more than 20 meters, and for this reason, it is useful in providing plenty of shade for humans and birds in hot summers. The tree has a smooth, delicate stem and asymmetric, alternating narrow leaves with a serrated edge. According to the people of Al-Quds, the fruits of the European Nettle Tree are sweet and edible and very popular among birds and other wildlife. The tree prefers light, can tolerate drought, and can grow in different soils, including poorly nourished ones. Despite the strangeness of the topic and the thinking, some Jerusalemites told about some traditions related to the Mediterranean Hackberry tree in that it is useful in expelling evil spirits and therefore, whoever sits under its shade is safe. They say that amulets, such as religious medallions and figurines made of the wood of those trees, have great strength.

White Mulberry or Silkworm Mulberry (Morus alba)

The White Mulberry or Common Mulberry or Silkworm Mulberry (so named because it is grown in countries around the world to feed silkworms used in the commercial production of silk) is a fast-growing exotic tree in Palestine that may range from 10 to 20 meters in length. Its berries are very tasty and edible when ripe. Only one White Mulberry tree was found growing in the courtyards of the blessed Al-Aqsa Mosque.

Common Fig (Ficus carica)

It is common in Palestine to plant Common Fig shrubs in vast areas called fig vines or in limited areas within orchards and farms for the delicious fruits that Palestinians love. Sometimes, figs are grown as ornamental plants in the streets, parks, and gardens. The Common Fig shrubs are deciduous, reaching 7-10 meters in height. Locally, figs are eaten fresh or dried (locally called *Quttain* and often imported) or as jam. Only one Common Fig shrub was found planted in the courtyards of the blessed Al-Aqsa Mosque.

Carob (Ceratonia siliqua)

The Carob (locally known as *Kharrub*), which is a drought-resistant species, is an evergreen tree that is widely cultivated in Palestine for edible pods and as an ornamental tree in gardens and landscapes. There are only eight individuals of this native Carob tree in the courtyards of the blessed Al-Aqsa Mosque. The Carob tree can be up to 15 meters in height and has a thick trunk, alternating pinnate leaves, and a broad, semi-globular crown. In Palestine, the long pods are commonly ground after removing the grains and turned into a cold and delicious Carob drink, which is sold in juice shops and street vendors, especially in the summer. Palestinians used to drink Carob juice, especially during Ramadan, the month of Muslim fasting.

Honey Locust or Thorny Locust (Gleditsia triacanthos)

The Honey Locust or Thorny Locust or Thorny Honeylocust, is an exotic deciduous tree that is highly adaptable to the different environments in Palestine. Only two trees were recorded inside the courtyards of the blessed Al-Aqsa Mosque. The trees can reach a height of 20-30 meters. The size of the plant pods generally ranges between 15-20 cm. Honey Locusts usually have long spines that grow out of the branches, hence the name Thorny Locust.

Honey Locust leaves are compound, with several small leaflets on one stem. These small leaflets turn yellow in the fall. It's too small to pick up, but it also won't clog drains, which made the tree popular for landscaping on some city streets.

River Red Gum (Eucalyptus camaldulensis)

The exotic River Red Gum is one of the most famous trees found in the jungles, parks, gardens, roads, and streets of Palestine, especially on the roads of the Gaza Strip, which is located in the far southwest of Palestine on the Mediterranean coast. The River Red Gum is considered one of the tallest trees in Palestine and may exceed 30 meters in height. Despite this, only one tree is currently recorded in the courtyards of the blessed Al-Aqsa Mosque. This seems surprising because the plant is common in Palestine in general, and it seems that the courtyards of Al-Aqsa Mosque sheltered numbers of it in the past, but they collapsed under some circumstances. The bark of the tree is smooth white or cream, and the leaves are lanceolate, which may exceed 15 cm in length. The proximity of River Red Gum trees to riparian habitats such as streams and bodies of water makes them important in embracing diverse elements of Palestinian biodiversity, especially birds. Moreover, the wood of the River Red Gum has been used locally for fencing, firewood, charcoal production, etc. In conclusion, the River Red Gum is of great importance as a source of the best types of bee honey in Palestine because it produces an abundant yield of nectar that honeybees feed on.

Common Myrtle or True Myrtle (Myrtus communis)

The Common Myrtle has many common names, such as True Myrtle, Bride's Myrtle, Roman Myrtle, Sweet Myrtle, Sweet Roman Myrtle, and True Roman Myrtle. It is a dense evergreen shrub, growing up to 5 meters, with aromatic small oval leaves and prolific white flowers. Leaves are highly scented when rubbed, so it is important to plant the shrub in driveways, patios, etc., where those leaves can be touched. This plant is known in most Palestinian homes, where it is grown in farms, gardens, on rooftops, and in pots. The plant has many medicinal uses in Palestinian society, and its leaves are usually placed in the famous Okra recipe and many others. As many as 5 individuals of this native Myrtle were recorded in the courtyards of the blessed Al-Aqsa Mosque. Because of its small size, the plant does not occupy a large amount of land, and therefore, the numbers in courtyards are very small.

Blue Plumbago or Cape Plumbago (Plumbago auriculata)

Blue Jasmine is one of the most beautiful plants that adorn landscapes, gardens, and parks in Palestine, especially when this plant is in beautiful harmony with other plants having flowers of purple, pink, yellow and white colors. Only two shrubs were encountered in the courtyards of the blessed Al-Aqsa Mosque. The plant is an exotic, evergreen shrub that usually grows as a climber and may reach 3-6 meters in length. The leaves are glossy green alternate, and the stems are long, thin, climbing. The flowers are pale blue, blue, or purple. They can attract a wide variety of insects, especially butterflies.

Great Bougainvillea (Bougainvillea spectabilis)

The Great Bougainvillea is a vine or ornamental shrub that can reach a height of 10 meters. It is a popular plant in the Palestinian environment as it is grown in homes, gardens, parks, and streets. In spite of that, there are only three of them in the courtyards of the blessed Al-Aqsa Mosque. The leaves are heart-shaped green, the stems are pubescent, and three pieces of paper surround the flowers, and their colors vary from purple to orange, white, and yellow. When a vine grows, the plant uses its thorns to cling to and climb trees. Its flowers attract the Palestine Sunbird (*C. osea*) and various species of butterflies for nectar and pollination purposes. Regular pruning is necessary to shape the plant and direct its growth because buds often grow vigorously.

Kurrajong or Bottletree (Brachychiton populneus)

The Kurrajong, or Bottletree, is a small to medium-sized tree. Its height can reach 10 meters or more. This exotic plant is grown as an ornamental tree in Palestine. As many as 7 trees were recorded in the courtyards of the blessed Al-Aqsa Mosque. The drooping leaves vary greatly in shape and may be simple and pointed, or they may be lobed. The leaves are useful as animal fodder. The flowers are bell-shaped and vary in color. This tree provides humans and animals with good shade. Some birds, bees, and butterflies are commonly attracted to the nectar and seeds of these trees.

Spineless Butcher's-broom (Ruscus hypoglossum)

The Spineless Butcher's-broom or Horse Tongue Lily is a perennial evergreen conglomerate. Up to 12 individuals were found in the courtyards of Al-Aqsa Mosque. The mature bush of the plant eventually reaches about 50 cm in height. It has a creeping rootstock and leaf-like phylloclades or flattened stems that are about 8 cm long to 4 cm wide, tapering at both ends. Its flowers and occasional red berries appear to grow from the center of its leaves but are actually emerging from leaf-like flattened stems called phylloclades. The name butcher's broom comes from an ancient use of the plant. Butchers tied a bunch of branches together and used them as a broom for cleaning.

Oleander or Nerium (Nerium oleander)

Oleander is an evergreen shrub that grows with erect stems and narrow lanceolate leaves up to 8 m high. This native species is used as a common ornamental shrub in Palestine, although only two individuals are recorded in the courtyards of Al-Aqsa Mosque. The flowers are white, cream, yellow, pink, or red. The plant is unpalatable to herding animals. It is known locally to be highly toxic to humans and animals. Taking it may cause nausea, vomiting, irregular heartbeat, hypotension, and even death.

True Laurel (Laurus nobilis)

The True Laurel, which has many common names such as Bay Laurel, Sweet Bay, or simply laurel, is an aromatic evergreen shrub with soft green leaves. It is native to the Mediterranean region, and its leaves are commonly used as

a spice in cooking. Only four individuals are recorded in the courtyards of Al-Aqsa Mosque. It is an excellent house plant. Outdoors, the plant is important for shaded areas of the landscape including patios, gardens, and parks.

Bitter Orange (Citrus x aurantium)

Bitter Orange, which is an exotic tree (*Citrus x aurantium*), is likely a cross between a Pomelo (*Citrus maxima* (Burm.) Merr.) and a Mandarin Orange (*Citrus reticulata* Blanco). It has many common names, such as Marmalade, Seville, or Bigarade Orange. Only three individuals were registered in the courtyards of Al-Aqsa Mosque. The tree has simple, alternate leaves and spines on its peduncles. The plant can be recognized by its orange fruits with a pronounced bitter or sour taste. Despite this fact, the Bitter Orange fruit can be used to make jam in many places of the world.

Threats facing the trees and shrubs in the courtyards of Al-Aqsa Mosque

There are several threats facing the trees and shrubs in the courtyards of the blessed Al-Aqsa Mosque as described here.

Israeli excavations under Al-Aqsa Mosque and its courtyards

Many of the perennial trees and shrubs of Al-Aqsa Mosque, especially those existing on the western side, fell suddenly. The most expected reason is the Israeli occupation excavations that cut the roots of these woody plants (Figure 5). On 8 November 2010 and 7 January 2013, Palestinian worshipers witnessed the fall of Aleppo or Jerusalem Pine (*P. halepensis*) trees, two of the oldest trees in the courtyards of the blessed Al-Aqsa Mosque near the Mastaba of Abu Bakr Al Siddiq or Mastaba of Pine located meters away from the Mughrabi Gate. Photos of some trees that fell showed the effects of eroding and shortness of their roots. They also showed that, the head of one of them bore dead branches, in a sign of poor nutrition due to the erosion of its roots. It should be noted here that most of the fallen trees and shrubs are located close to the Mughrabi Gate, that is, near the Israeli excavation sites that prevail west of Al-Aqsa Mosque. The fall of Aleppo Pine trees, despite their famous strength and depth of roots and their resistance to various weather conditions, may be an indication of the progress made by the Israeli excavations beneath the blessed Al-Aqsa Mosque. Another example of the possible impact of the Israeli excavations was the fall of a perennial Date Palm tree (*P. dactylifera*) on the evening of 19 August 2012, which had previously been seen tilting and veering towards the ground. Some officials and worshipers cut the trunk of the palm tree and moved it outside the courtyards of the blessed Al-Aqsa Mosque. In conclusion, Jerusalemites and worshipers talked about the repeated fall of some of the old trees in the courtyards of the blessed Al-Aqsa Mosque because of the Israeli excavations. They stressed that the trees dry up and die in the first stage and then fall to the ground.

Toxic materials and chemicals

The Israelis' use of some toxic materials and chemicals to break up the soil and facilitate excavations destroys the roots of woody plants scattered in the courtyard of the blessed Al-Aqsa Mosque, then collapse and fall to the ground. This act was widespread on the western side of Al-Aqsa Mosque near the Mughrabi Gate. Many worshipers who roam the courtyards of Al-Aqsa Mosque stated that some Israeli settlers were seen spraying toxic chemicals on some perennial trees and shrubs with the aim of preventing their growth or their subsequent death.

Cutting down trees and shrubs of Al-Aqsa Mosque for Israeli security purposes

Some worshipers at Al-Aqsa Mosque mentioned that the Israeli occupation authorities, on specific occasions, cut down old trees inside the courtyards of Al-Aqsa Mosque on the pretext that they obstruct achieving clear imaging of the smart and sensitive surveillance cameras that are installed on the walls and facilities of Al-Aqsa Mosque.

Burning of trees and shrubs

The fires that broke out in the courtyards of the blessed Al-Aqsa Mosque and burned many trees and shrubs are mainly due to the Israeli military operations as a result of the use of sound, incendiary, and tear gas bombs, rubber-coated metal bullets, live bullets, and others. The last of these fires occurred on Monday (10 May 2021) evening and Friday (22 April 2022) morning. Firefighting teams of the Civil Defense in Al-Quds managed to put out fires in the Evergreen Cypress (*C. sempervirens*) trees of the blessed Al-Aqsa Mosque from the side of the Mughrabi Gate (Figure 6). There is no doubt that the burning of perennial trees and shrubs causes their disfigurement and possibly their subsequent destruction.

Israeli prevention of replanting or cultivation of trees and shrubs

The Israeli occupation forces prevent and restrict the introduction of any new shoots or seedlings for planting in place of those trees and shrubs that burn, uproot, or die in the courtyards of the blessed Al-Aqsa Mosque. This means that what is uprooted or destroyed from vegetation cover is not compensated by replanting new seedlings. Such actions would contribute to a gradual decrease in the trees and shrubs in the courtyards of the blessed Al-Aqsa Mosque, both in terms of quantity and species. It is worth noting that plant diversity increases the beauty of the courtyards and attracts the elements of animal biodiversity that increase the splendor of the place, such as birds, butterflies, and others. The endemic Palestine Sunbird (*C. osea*), which is the smallest and most beautiful among the birds of Palestine, is common in the courtyards of the blessed Al-Aqsa Mosque, and it is often seen and enjoyed by visitors and worshipers of Al-Aqsa Mosque while licking and sucking the nectar of flowers.

Figure 5. The death of many giant trees in the courtyards of the blessed Al-Aqsa Mosque, Palestine, and the reason is mostly due to Israeli excavations: A. Atlantic Pistachio tree (*P. atlantica*); and B. Evergreen Cypress tree (*C. sempervirens*) (Source: Abu Ali 2021)

Figure 6. Frequent fires in Evergreen Cypress trees (*C. sempervirens*) and others due to the fierceness of the weapons and bombs used by the Israeli army forces at the gates and in the courtyards of the blessed Al-Aqsa Mosque, Palestine

Figure 7. The fall of several Evergreen Cypress trees (*C. sempervirens*) during the past years and decades in the courtyards of the blessed Al-Aqsa Mosque, Palestine due to severe storms and strong winds

Storms and strong winds

Some perennial trees and shrubs fall due to severe storms and strong winds that the city of Al-Quds sometimes witnesses. These climatic factors cause some trees to be completely uprooted or severely broken (Figure 7). And because the Aleppo or Jerusalem Pine (*P. halepensis*) and the Evergreen Cypress (*C. sempervirens*) trees planted in the courtyards of the blessed Al-Aqsa Mosque are strong and resistant to natural factors, their fall cannot be justified by natural causes only, but rather by unnatural causes represented in the deliberate sabotage of the vertical roots of these trees due to Israeli excavations and the use of chemicals or solvents to weaken the soil that supports them or by neglecting the periodic care of trees and shrubs in the blessed Al-Aqsa courtyards. In any case, it is necessary for scientific and agricultural forums to take samples from trees that fall and from the soil as well to know the real causes of falling trees.

Disease infection

Some agricultural workers believe that infection of some perennial trees and shrubs with fungi and other pathogenic factors may have led to the erosion and rotting of their roots until they fell due to prolonged neglect and lack of care. It is not excluded that the spread of the Red Palm Weevil (*R. ferrugineus*) more than a decade ago in Palestine contributed to the destruction of some palm trees in the courtyards of the blessed Al-Aqsa Mosque.

Discussion

The blessed Al-Aqsa Mosque in the city of Al-Quds (Jerusalem), Palestine, enjoys a special and prestigious place among Muslims all over the world, especially the Palestinians, who are keen to visit it and pray in it. Palestinians usually roam the Al-Aqsa Mosque and its vast courtyards in order to learn about the treasures and historical relics that distinguish it from other historical, religious, and archaeological places in the country. Many books described about the features of the blessed Al-Aqsa Mosque and highlighted their status (Al-Quds International Institution - QII 2009; Maarouf and Mari 2012: PASSIA 2015; Al-Jallad 2017; Alwatanvoice 2017), but researchers rarely address the plant and animal features that prevail in its courtyards and surroundings. Therefore, the current study comes to examine the woody plants (trees and shrubs) that adorn the courtyards of the blessed Al-Aqsa Mosque, especially since some of them existed a long time ago. Trees, shrubs, and any forms of vegetation in the courtyards of the blessed Al-Aqsa Mosque provide great services to the nature and environment of this place in Palestine, as well as to the people of Palestine, worshipers, and visitors alike. There is no doubt that trees and shrubs add to the splendor of the courtyards of the blessed Al-Aqsa Mosque, above the splendor of the Dome of the Rock, the Al-Qibli Mosque, and other religious and historical landmarks. Trees and shrubs provide shade and rest for worshippers, tourists, and visitors.

The vegetation cover in the courtyards of the blessed Al-Aqsa Mosque attracts many forms of Palestinian animal diversity, especially the bird fauna that worshipers and

visitors see in the place. Large numbers of birds roam the place constantly, and some of them may breed in the same place as well. The tweets emanating from songbirds (passerines or perching birds) are considered a symbol of beauty and pleasure. The way some birds fly, such as swallows, bee-eaters, pigeons, and doves, increases the vitality and fun of the place. The way in which some birds feed on fruits, grains, food scraps, and flower nectar also attracts the attention of those in the courtyards of the blessed Al-Aqsa Mosque. For example, the Palestine Sunbird (*C. osea*), which is a small endemic passerine bird of the sunbird family, Nectariniidae, is considered one of the smallest of all Palestinian birds. It is distinguished by its bright colors and the way it feeds on the nectar of flowers (Kaczorowski et al. 2014; Abd Rabou 2019). The visitors of Al-Aqsa Mosque usually enjoy the Palestine Sunbird as a Palestinian national and endemic bird that resides in the courtyards and emits beautiful tweets.

The current work revealed as many as 30 tree and shrub species grown in the courtyards of the blessed Al-Aqsa Mosque, Al-Quds (Jerusalem), Palestine. Of these tree and shrub species, 70% were exotic in the sense that they were introduced to Palestine from completely separate (often far) geographical areas via human intervention (Abu Ayyash et al. 2007). The rest 30% of the species were native. The process of planting trees and shrubs in the courtyards of Al-Aqsa Mosque is not like any other urban ecosystem in Palestine due to the historical and religious character of the place. In addition, Israeli measures that largely control the situation in the courtyards of Al-Aqsa Mosque, including the vegetation, limit its cultivation and development. Although exotic species accounted for 70% according to the current results, studies of trees and shrubs in urban ecosystems in the Gaza Strip showed higher percentages of exotic species. Abbas (2016) and Abd Rabou (2018, et al. 2019) revealed that 80.4%, 94.0%, and 92.45% of the tree and shrub species encountered in their studies, respectively, were exotic.

The cultivation of exotic species in local Palestinian environments, including the courtyards of Al-Aqsa Mosque, has provided many advantages. An exotic plant may be free from native pests and diseases, and it may be immune from many pests in the new country it has entered. The dense foliage and crown can be a refuge for many forms of biodiversity, especially vertebrates and invertebrates. Moro et al. (2014) revealed that many deciduous exotic species can provide greater solar access to the sites where they were grown during fall and winter. From a purely ecological point of view, there is good value for native plants in benefiting bird fauna and other wildlife categories. This is because local species of plants and animals evolved together, so native plants are more likely to provide the right mix of foods and support insects and other invertebrates that birds and other wildlife need to thrive.

Gymnosperms (conifers) are evergreen bare plants that are prominently grown in various Palestinian environments. They are usually found or planted in abundance in various urban ecosystems in Palestine, such as gardens, parks, cemeteries, hospitals, schools, universities, etc. In the current study, gymnosperms were represented by only 4 species. The Evergreen Cypress tree (*C. sempervirens*) is commonly found in the courtyards of Al-Aqsa Mosque, reaching 274 individuals, which represents about 26% of the total species of trees and shrubs in the place. This species is known to provide wind resistance, shade, and beauty as well as being a refuge for birds and other creatures. Moreover, Abd Rabou et al. (2008) indicated that this species was exploited as a source of timber during the past decades in the Gaza Strip. This Mediterranean pioneer species seems to grow rapidly in most soil types in Palestine, including stony and compact soils (Abu Ayyash et al. 2007). It is well adapted to the Mediterranean climate, which is characterized by dry and hot summers and rainy and cold winters (UNEP 2003). As for the second species of gymnosperms present in large numbers in the courtyards of Al-Aqsa Mosque, it is the Aleppo Pine or the Jerusalem Pine (*P. halepensis*), which reached 85 individuals, representing about 8% of the tree and shrub species there. Similar to the Evergreen Cypress, the Aleppo Pine is an attractive drought-tolerant evergreen pine well adapted to growing in hot, dry conditions. The presence of Aleppo Pine in abundance in the courtyards of Al-Aqsa Mosque may be explained by the fact that it spreads over vast areas of Palestine and has many uses (Abu Ayyash et al. 2007). What distinguishes this tree is that it is able to colonize open and disturbed areas quickly, as it has the ability to grow on all substrates and in almost all Mediterranean bioclimates (Fady et al. 2003; Maestre and Cortina 2004).

The monocot angiosperms were represented in this study by only two species: the Date Palm (*P. dactylifera*) and the Mexican Fan Palm or the Mexican Washingtonia (*W. robusta*). Only 7 individuals of the two species were encountered in the courtyards of Al-Aqsa Mosque, although the two species are very widespread in Palestine. The Date Palm is considered a strategic crop in Palestine, and several strains of it exist throughout Palestine. Surprisingly, only three individuals of Date Palm trees were present in the courtyards of Al-Aqsa Mosque. This can be explained by the fact that the numbers were greater in the past than they are now. In fact, the Israeli excavations under Al-Aqsa Mosque posed a clear threat to many of Al-Aqsa Mosque's features, including the botanical features, of which Date Palm trees are a part. An insect pest called the Red Palm Weevil (*R. ferrugineus*) has spread in Palestine in the last two decades, and it has caused the destruction of huge numbers of Date Palm trees in Palestine. For example, this pest has infected large numbers of Date Palm trees and caused their destruction in the Gaza Strip (Abbas 2016; Abd Rabou and Radwan 2017a,b; Radwan 2017; Abd Rabou 2018, et al. 2019). With regard to the Mexican Fan Palm, Palestinian municipalities prefer the cultivation of this species due to its low water requirements and its high tolerance to drought and salinity (Jones 1995).

The dicot angiosperm trees and shrubs were represented in the current study by 24 species. The European Olive (*O. europea*) was the most common species with 550 individuals representing 52.78% of the entire tree and

shrub species recorded in the courtyards of the blessed Al-Aqsa Mosque. The species is a perennial agricultural and ornamental plant widely cultivated in various rural and urban areas within Palestine (Fernley-Pearson 2014). Olive trees or bushes are considered one of the main and important agricultural crops in Palestine, as they are mostly planted to produce olive oil, which Palestinians love. The importance of the European Olive trees comes from the fact that many Palestinians view the Olive tree as a symbol of nationality and connection to the land, particularly because of its slow growth and longevity (Fernley-Pearson 2014). In fact, Olive trees of all strains symbolize the steadfastness of the Palestinians in their land and are revered and deeply respected for their ability to flourish and take root deep in the land where water is hard to come by. In Palestine, many olive trees are thousands of years old and yet they continue to produce olives (Fernley-Pearson 2014; Sharkawi 2019). From a cultural point of view, the names of many Palestinian villages and towns are associated with the cultivation of olives. They are either linked to the cultivation of the tree or the extraction of its oil. Examples abound in the villages of Al-Masara, Asira, Zeita, and Ain Al-Zaytoun, in addition to the city of Birzeit (the oil well), all of which are located in the West Bank of Palestine (Sharkawi 2019). In the Gaza Strip, there is an entire neighborhood called Al-Zaytoun due to the abundance of olive cultivation in it.

Analogous local studies by Abbas (2016) and Abd Rabou (2018, et al. 2019) pointed out that the European Olive was among the important woody plants cultivated in the main streets, green spaces, and the campus of the Islamic University of Gaza in the Gaza Strip. Such an extensive cultivation of the species in the Gaza Strip and vast areas of Palestine is certainly attributed to its cultural, environmental, ecological, economic, and medicinal values. The olive fruits are loved and respected by the Palestinians because they are delicious and mentioned in many verses of the Holy Quran including verse 1 of the Surat At-Teen. With the confiscation of Palestinian lands in the West Bank and Jerusalem, the Israelis and their settlers bulldoze Palestinian Olive lands and destroy those trees in front of their owners. Indeed, the bulldozing and destruction of Palestinian Olive trees has become a feature of the ongoing Israeli aggression against the Palestinians and their lands. The matter did not stop there. Rather, the Israeli settlers deliberately release large numbers of Wild Boars (*Sus scrofa* (Linnaeus, 1758)), one of the largest wild mammals in Palestine, in order to sabotage their agricultural lands, especially Olive saplings and trees. This abounds during the Olive harvest seasons, which indicates the entry of Wild Boars into the political and military aggression against the Palestinians (Abd Rabou et al. 2022).

Again, from an economic point of view, the people of Jerusalem, during the olive harvest season, pick olives from their places in Al-Aqsa Mosque in coordination with the Islamic Endowments Department in Jerusalem and after pressing the olives; the olive oil is distributed annually to low-income families in Jerusalem. There is no doubt that this activity aims to connect Jerusalemites (people of Jerusalem or Al-Quds) more with the blessed Al-Aqsa Mosque and encourage them to serve and rebuild it. Despite this, it seems that the production of olive trees in the courtyards of Al-Aqsa Mosque is relatively declining because the Israeli occupation authorities may uproot any olive tree planted inside the courtyards of Al-Aqsa Mosque without its consent. They also prevent the introduction of new seedlings, fertilizers, and chemical pesticides that are necessary to take care of the olive trees and increase their production (Al-Jazeera.net 2017).

Many of the large trees in the courtyards of Al-Aqsa Mosque are still important and have an environmental or historical status. The Coastal She-oak or Horse-tail She-oak Tree (*C. equisetifolia*) is a well-known plant species in Palestine that is grown to provide good timber, prevent erosion, stabilize the soil, and as a windbreak (Fernley-Pearson 2014; Ighbareyeh et al. 2022a,b). It was represented by only 20 individuals in the courtyards of Al-Aqsa Mosque. The Tree of Heaven or Varnish Tree (*A. altissima*), which was represented by only 13 individuals in the courtyards of Al-Aqsa Mosque, is another important tree despite its low occurrence in the ecosystems of Palestine (Al-Sheikh and Qumsiyeh 2021). In Jerusalem, Rinat (2013) described the tree by saying a species of tree with a heavenly name is wreaking physical havoc on the vegetation of the city. The problem with spreading the species is that it creates shade that prevents the growth of other plants. In addition, its leaves secrete a chemical that prevents native plants within a radius of several meters from germinating (Rinat 2013; Mahassneh 2021). The root system of the species is aggressive enough to cause damage to sewers and foundations (Walker 2017; Mahassneh 2021). The Tree of Heaven is already known to be an invasive species and a problem in open areas in Palestine, where it has become an ecological threat to local plants (Al-Sheikh and Qumsiyeh 2021). This dangerous matter may affect some plants that may be negatively affected by the presence of the Tree of Heaven in the courtyards of Al-Aqsa Mosque.

Although it was represented by only 6 individuals in the current study, the River Red Gum (*E. camaldulensis*) is a common and famous tree species that was known to be planted in Palestine, including the Gaza Strip, for decades and perhaps centuries. The plant seems to be resistant to high levels of drought, temperatures, and salinity. According to various Palestinian studies, *Eucalyptus* spp. has many economic, environmental, ecological, and natural benefits. The trees are good for setting up windbreaks, green belts, and landscaping. The trees work to adjust the local climate and temperatures, stabilize the soil, and cultivate marshes and abandoned lands. The plant is a good source of wood, timber, honey production, and aromatic and medicinal materials (Al-Zaghat et al. 1993, 1997; Abd Rabou et al. 2008).

The presence of many species of fruit trees and shrubs in the courtyards of Al-Aqsa Mosque may be advantageous in the sense that they provide food for both people and wildlife. The fruit trees and shrubs, namely the Date Palm (*P. dactylifera*), Olive Tree (*O. europea*), and Common Fig (*F. carica*), which were recorded in the current study, are more or less represented in such urban environments within

the borders of the Gaza Strip (Abbas 2016; Radwan 2017; Abd Rabou 2018). Such presence of fruit plants may be disadvantageous in the sense that the fruits can pollute the grounds by increasing the waste level and attracting annoying insects and harmful rodents. These facts were found to be consistent with the findings of many studies dealing with urban fruit trees and shrubs (Barker 1986). Finally, suppose it is permitted to plant new plants in the courtyards of the blessed Al-Aqsa Mosque. In that case, it is important to choose types of woody plants that are compatible with the prevailing environmental and ecological conditions in Palestine and that add beauty and splendor to the gardens and courtyards of this great, Islamic, and historical place in Palestine.

For several decades, specifically since 1967, Israel has been excavating under the Al-Aqsa Mosque and its courtyards as part of the search for the so-called "Solomon's Temple." In fact, Israeli excavations under and around the blessed Al-Aqsa Mosque pose a very serious and existential threat to this religious landmark dating back to the 7th century AD. The Israeli goal in their excavations under Al-Aqsa Mosque is not limited to establishing their presence and trying to search and find any historical evidence of them in Al-Quds (Jerusalem). Still, they are also trying to obliterate and destroy the ancient Islamic monuments and landmarks. According to Al-Jubeh (2019) and Al-Zaghmouri (2021), Israel used these archaeological excavations as one of the means of Judaizing the lands of Palestine, and through them working to prove the Jewish right to this land and to demolish the blessed Al-Aqsa Mosque and build the alleged "Solomon's Temple" in its place.

With regard to the topic of this study, the phenomenon of trees drying up and falling after they die often indicates malnutrition caused by cutting their roots with various excavation equipment used by the Israeli occupation under the landmarks of Al-Aqsa Mosque. Perhaps what supports this falling of trees is the Israeli occupation's use of toxic and chemical materials to break up the soil and facilitate excavations, as many Jerusalemites and worshippers in the courtyards of Al-Aqsa Mosque have explained. Almayadeen (2012), Farag (2012), Al-Jazeera.net (2016), Abu Ali (2021), Albawsala (2022), and Assali (2024) pointed out that the trees of Al-Aqsa and the slow killing of valuable information about the types of trees that were killed by Israeli excavations or any other Israeli activities supported by dates and places. In general, many agree that the reason for the trees falling in the courtyards of Al-Aqsa Mosque is the Israeli excavations under the mosque, in addition to another hypothesis that the Israeli settlers sprayed the trees with toxic chemicals, which caused them to die and decompose.

Other threats include cutting and burning trees and shrubs in the courtyards of the blessed Al-Aqsa Mosque. These Israeli practices are not limited to the courtyards of Al-Aqsa Mosque only but extend to include all Palestinian territories in the West Bank and Gaza Strip. The Israeli occupation claims that the removal, bulldozing, destruction, and burning of all types of plants in the Palestinian territories comes for security reasons, including clarifying the vision with smart cameras in the courtyards of Al-Aqsa Mosque, revealing areas to prevent ambushes by Palestinian resistance fighters, establishing buffer zones, and other reasons. These Israeli measures often pose a threat to the lives, places of residence, and livelihoods of Palestinians and undoubtedly affect the Palestinian environment, ecology, and biodiversity (Abdallah and Swaileh 2011).

In addition, the Israeli occupation controls the planting or replanting of dead trees and shrubs in the courtyards of Al-Aqsa Mosque. This simply means that damaged or dead trees and shrubs are not replanted, and thus, the vegetation cover in this Islamic, spiritual, and historical landmark decreases. The severe storms and strong winds that sometimes hit the elevated city of Jerusalem contribute to uprooting, breaking, or disfiguring some perennial trees and shrubs. This is made worse by Israeli excavations, a practice that significantly impacts the environment, and the use of chemicals or solvents to weaken the soil. Diseases, fungal and insect pests, and lack or slowness of periodic care are other factors that may contribute to the death of some trees and shrubs in the courtyards of the blessed Al-Aqsa Mosque as in the whole of Palestine (Blumberg 2008; Abu-Qaoud 2015; Abd Rabou and Radwan 2017a; Samara et al. 2018).

ACKNOWLEDGEMENTS

The researchers would like to thank all the people of Al-Quds, Palestine, for encouraging this study and supporting it with all information related to the trees and shrubs prevailing at the courtyards of the blessed Al-Aqsa Mosque in Palestine.

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