International Scholars Journals

Advances in Agriculture and Agricultural Sciences ISSN 2381-3911 Vol. 3 (6), pp. 001-039, June, 2017. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

The floristic composition of some historical botanical gardens in the metropolitan of Cairo, Egypt

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Accepted 03 January, 2017

In this article, we studied the historical background of six major historical botanic gardens that were established by the Khedive Ismail (1863 - 1879) in the second half of 19th century in Cairo city, and report their floristic composition. These gardens were Zohriya, Aquarium, Ezbekiya, The Zoo, Orman and Horreya. In addition, the present status of these six gardens was addressed in particular, area, land use, landscape architecture and the taxonomic diversity of the plants growing in each garden. The distribution patterns of the recorded species were also presented using the multivariate analysis techniques (classification and ordination). An updated annotated list of cultivated species in these gardens will be provided.

Key words: Cultivated plants, urban flora, botanical and historical gardens, national parks, Egypt.

INTRODUCTION

Horticulture and botanic gardens in Egypt in the 19th century

Since the reign of Mohammed Ali (1805 - 1844), the subject of introduction and acclimatization of new plants received much attention in Egypt. His famous son Ibrahim Pasha made a garden at Rodah where many of the ornamental trees, now largely cultivated in the country, were introduced for the first time. However, the development of the modern European style of horticulture in Cairo gardens commenced during the reign of the Khedive Ismail (1863 – 1879). His period was remarkable in the history of Egypt for the creation of several large experimental gardens and public parks (El-Sheshtawy, 1969).

The present study aims primarily to compare and document the variation in the floristic diversity of six historical botanic gardens constructed by the orders of Khedive Ismail in the metropolitan Cairo city, namely: Zohriya, Aquarium (Fishes), Ezbekiya, The Zoo, Orman and Horreya. In addition, the history and the present status of each of the studied garden including landmarks, landscape architecture and structure is also presented. An annotated list of the floristic composition of each garden is also provided.

Few studies were focused on the historical gardens and parks in Egypt; amongst others, Wittig et al. (1985), Nath (1990), Ivanova and Ivanova (1992) and Ignatieva and Konechnaya (2004) . The oldest and most important contribution was that of Clot Bey (1840) "*Aperçu Général sur L'Egypte*". Clot Bey enumerated the cultivated plants that were grown at the time of both Mohamed Ali and Ibrahim Pasha. He presented also the design and architecture of Shubra and Roda Island gardens, and reported the foreign plants intro-duced into these gardens. In addition, a full account of the economic potentialities and origin of these plants was presented. Moreover, the numbers of native trees, foreign trees, the natural fruit trees, the recently introduced foreign fruit trees, graminaceous plants, non graminaceous plants, vegetables and leguminous plants, fibre plants, dye

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plants, ornamental plants, use-ful plants, landscaping and ornamental plants, and wild plants were also recorded.

In his account, *"Studi Scientifici Sull'Egitto e Sue adiacenze compresa la penisola dell' Arabia Petrea"*, Figari (1865) classified the cultivated plants into 6 main groups: cereals (16), fodder (4), vegetables and salads (54), economic (31), trees (69) and ornamentals (234). Within each group, the plants were delimited according to their families, and each species was given Latin name, Arabic name, vernacular name, as well as full description, origin, propagation methods and uses.

Delchevalerie; the chief gardener at the time of Khedive Ismail; published a number of accounts that dealt with the cultivated plants in Egypt. Among the most important, Delchevalerie (1870) published *"Plantes Tropicales Utiles, Officinales et Industurielles"* suggesting the plants, which can be introduced into Egypt and can grow below 30°C. The list comprised 96 species that have a potential value such as being aromatic, textile, medicinal, resin, gum and dyes producing plants. In his account "*Flore exotique du jardin d'acclimation de ghézireh et des domains de son altesse le Khédive",* Delchevalerie (1871) outlined the history of horticulture and agriculture in ancient Egypt, and in the reign of Mohamed Ali, he demonstrated a legend of the floristic taxa found in the experimental gardens at Gezireh west of Cairo. The contribution by Delchevalerie (1899) *"Les Promenades et Les Jardins du Caire*" that was later translated into Arabic by Shabatei, in 1924; presented the history and floristic composition of taxa in many gardens e.g., Giza and Gezirah; Hussein Kamel garden at Giza; Shubra garden north of Cairo; Qubba garden east of Cairo; Roda Island and Ezbekiya gardens. Besides, a general catalogue included 4000 species of annuals and perennials cultivated in the fields and gardens of Khedivial palaces at the 19th century were also presented. At that time, Ascherson and Schweinfurth (1887) also enumerated the entire plant species (wild and cultivated) in their famous work *"Illustration de la flore d'Egypte*". Muschler (1912) appended 310 species belonging to 81 families of the most frequent cultivated and garden plants in Egypt. Täckholm and Drar (1941, 1950, 1954, 1969) published four monumental volumes that covered the entire wild and cultivated plant families of monocotyledons in Egypt, but their attempt to complete the entire flora of Egypt was stopped abruptly with the death of M. Drar in 1964 and Täckholm in 1978.

In her first valuable contributions, Bircher (1960) presented a handbook for gardening in Egypt and the subtropics including a brief account on the historical development of the gardens. She described and classified about 2000 species grown in the gardens of El-Saff about 50 km south of Cairo, giving the origin and vernacular name for each species. In addition, she made a list of plants viewed from different points such as their characters and utility, as well as a monthly calendar recording approximate dates of flowering, sprouting, fruiting and shedding of leaves. Recently, Khalifa (1995) described the different styles of botanical gardens in Egypt, he mentioned the important 15 gardens in Cairo, 7 gardens in Alexandria as well the Plant Island at Aswan and described how the plant taxa influenced in the landscape of gardens. He also summarized their history, area and floristic composition. Bircher (1998) updated the English version of the original work of Delchevalerie "*Les Plantes Exotiques Cultiveés en Egypte"* and added notes concern the country of origin for each species, economic importance and history of its cultivation especially in El-Saff botanic gardens. The list comprised about 600 species belonging to 331 genera and 112 families of seed plants. More recently, Labib et al. (2003) updated and revised the cultivated gymnosperms growing at the Orman botanic garden. A documentary study on the Ezbekiya garden (Mohamed, 2004) including its site, area, history and floristic composition was published. Diwan et al. (2004) published in Arabic a review entitled *"Plant Atlas of Botanical Gardens in Cairo and Giza"* giving a historical overview on ten gardens. On the other hand, Farahat (2005) studied the vegetation-environment relationships in El-Qanatir Public Park (constructed at the end of the 19th century south of Nile Delta, about 24 km north of Cairo). He recorded 112 ornamental species; trees and shrubs have the highest contribution (80 species), followed by climbers (9), palms (8), succulent and spiny plants (6), perennial and annual plants (4) and finally conifers (4).

Cairo: past and present

Cairo, the capital of Egypt, is the largest city in the Middle East and Africa. Officially speaking, Cairo was founded in 969 AD, yet parts of the metropolis date back to the time of the Pharaohs. It is at least twice as old as Paris, 7 times as old as Berlin, and 15 times as old as New York City. In the 19th century, Khedive Ismail (1863 – 1879) constructed what is now considered the city center of Cairo. The old city was neglected and gradually fallen into disrepair. By the turn of the 20th century, most commercial activities moved into modern Cairo (Ali, 1998). Today, the metropolitan Cairo is made up of the historical Cairo, the city of Giza, the islands Gezira and El-Roda, and regions in Qalubiya, north of Cairo proper. Today, Cairo covers an area of almost 300 km^2 and is expanding further in the east and south directions. Figure 1 shows the increase in the total area of Cairo since 860 AD to the year 2000. Its total area was increased more than 1000 times in about 1140 years.

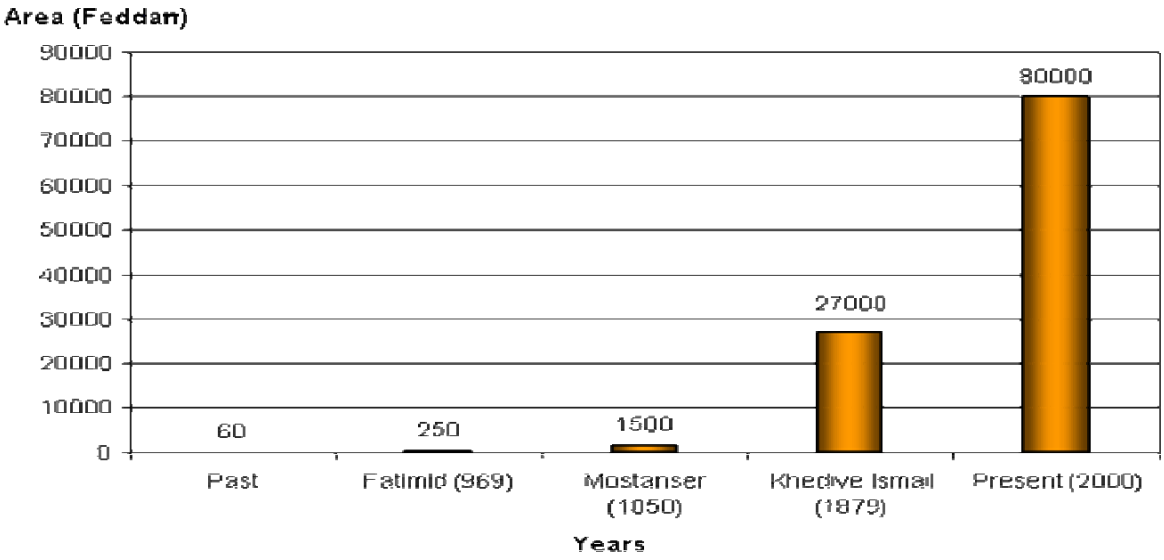

Figure 1. Diagram illustrating the increase in the area of Cairo during the last millennium.

Cairo botanical gardens in the 19th century

The first botanic garden in Egypt was established during the time of Mohamed Ali at Abu Za'abal near Khanka (north east suburb of Cairo), and was later transferred to the Qasr Al-Ainy Hospital (El-Hetta, 1950). At his time also a garden of about 60 Acres (1Acre=1Feddan) was established around his palace at Shubra (north suburb of cairo) . Not only did Mohamed Ali seek the cultivation of trees and gardens, but he also tried to extent the area of cultivation by encouraging the reclamation of lands. He ordered to cultivate 16,000,000 trees in the Nile Delta region (Draper, 1898). We are indebted to Ibrahim Pasha in the propagation and distribution of plants throughout the country as more than 5,000,000 ornamental and fruit trees were cultivated (Drar, 1923). Not only the Roda Island was utilized as an experimental ground for acclimatization and propagation of plants but also was considered a public park. Under the auspice of Khedive Ismail Pasha (1863 – 1879); whose deep interest and devoted love for the promotion of horticultural knowledge in Egypt, innumerable plants were brought from Europe and America. The opening of the Suez Canal in 17th November 1869 had also greatly facilitated the import of a vast arboreal wealth in the form of seeds or live plants from the Far East. During the reign of Khedive Ismail the six gardens dealt with in this article were established. More gardens were also constructed in the second half of the 18th century. Available information about some historical botanic gardens in Egypt during the 19th century and the early beginning of the 20th century is summarized in Table 1. This information includes the year of establishment, total area (in Feddans), and the gardeners who established these gardens.

MATERIALS AND METHODS

Field work and data collection

For the purposes of this study, several visits were made between 2004 and 2006 to the six gardens Zohriya, Aquarium, Ezbekiya, The Zoo, Orman, and Horreya. For each studied garden, the present floristic status has been described in terms of species presence/absence, and the general distribution of these species among the six gardens is documented. Taxonomic diversity and growth forms in each garden have been also estimated and graphically compared. Voucher specimens for most of the recorded taxa have been identified and checked at the herbaria of Cairo University (CAI) and the Orman garden where duplicates were preserved and kept. Systematic and nomenclatural revisions of the recorded taxa have been carried out by the aid of GRIN (Germplasm Resources Information Network), Huxley et al. (1992), Bailey and Bailey (1976), Hooker and Jackson (1893).

Available information such as area, year of establishment, species composition and landmarks for each of the studied gardens was obtained from several sources. Historical documents, photos as well as travelers' books, that were designed and drawn at different periods were obtained from Dar El-Kotob (the Book House), National Documents House, and the Egyptian Geographical Society. Recent data including maps, photos and satellite images, for the gardens, have been downloaded using the Google Earth Software and comparisons were made to show how much changes had occurred to these gardens during the last 130 years. It is hoped that the appended checklist of the floristic composition of these botanical gardens is significant for any future studies in conserving national parks and gardens.

Table 1. Summary of the available information on the major historical botanic gardens that were established in Cairo during the 19th and the early beginning of the 20th centuries.

No	Garden's Name	Year of Establishment	Ordered by	Gardeners	Total old area (Feddans)
1	Shubra	1806	Mohamed Ali Pasha	Turkish,Greek gardeners, Trial & Bové	70
2	Roda island	1830	Khedive Ibrahim	Trial, Bové (1829) & Macullock	40
3	El-Qanatir	1834	Mohamed Ali Pasha	Draper	120
4	Zohriya	1868	Khedive Ismail	Des Champs Delchevalerie & Gaby	49
5	Ezbekiya	1872	Khedive Ismail	Des Champs, Delchevalerie & Stamm	20
6	Orman	1873	Khedive Ismail	French gardeners	95
7	Aquarium	1871	Khedive Ismail	---	10
8	The Zoo	1890	Khedive Tawfik	Des Champs & Delchevalerie	50
9	Prince Mohamed Ali	1901	Prince Moh. Ali	---	14.4
11	Japanese	1919-1922	King Fouad I	-----	10
12	Andalus	1929	King Fouad I	----	2.25

Data analysis

A data matrix was constructed based on a binary presence-absence codes for 968 species in the studied six gardens. The data was processed by multivariate analysis using Multivariate Statistical Package MVSP for Windows, version 3.1 (Kovack, 1999) . For the classification of gardens, cluster analysis using minimum variance as agglomeration criterion (Orloci, 1978) was applied to squared Euclidean distance dissimilarity matrix. The obtained groups were represented in a dendrogram. In order to reveal possible intrinsic patterns, garden ordination with Principal Coordinates Analysis (PCoA) was preferred using the product-moment correlation as a coefficient. We preferred PCoA than a PCA (Principal Components Analysis) because the former performs better on data sets with missing data (Rohlf, 1972). Gardens that are more similar in vegetation structure (species composition and abundance) were depicted as being closer together in the diagram. Species richness (alpha diversity) was calculated as the total number of species in each garden. All the statistical analyses were carried out using SPSS for windows version 10.0.

RESULTS AND DISCUSSION

The Zohriya garden (Zoh)

History and structure: The Zohriya (in Arabic= Vase or flower vessel) garden was established in the southern side of the Gezira island with a total area of 49 Feddans in order to supply the Khedivial palaces and nurseries with sufficient plants and flowers. Delchevalerie (1870) established in this garden the first station for acclimatization of plants and where special attention was paid for propagation of tropical fruits such as the bread tree, the sapodilla plum and the mango. The last station was created in 1876, and was divided into 4 main sections (fruit trees, vegetables, ornamentals and experimental stations). The plants that constituted these 4 sections were furthermore grouped under 60 sub-classes. A large number of foliage plants such as palms, cycads, *Aralia* and *Dracaena* that were introduced from India, America and Australia were also grown in suitable accommodations. In 1917 this garden was affiliated to the Ministry of Agriculture to be a station for acclimatization and propagation of plants as well as a place for horticultural exhibitions.

Landmarks and floral composition

The garden is divided into six quarters: the Mango, the Quercus, the Cupressus, the Cassia, the Chorisia and the administration. Its current area has been reduced from 49 Feddans to only eight Feddans (Figures 2, 3 and 4). It contains13 green houses for plant acclimati-zation, eleven of which date back to the time of its establishment with many coral reefs inside. The roses, were also a fascinating landmark of this garden.

This garden is rich with many species taxa and con-

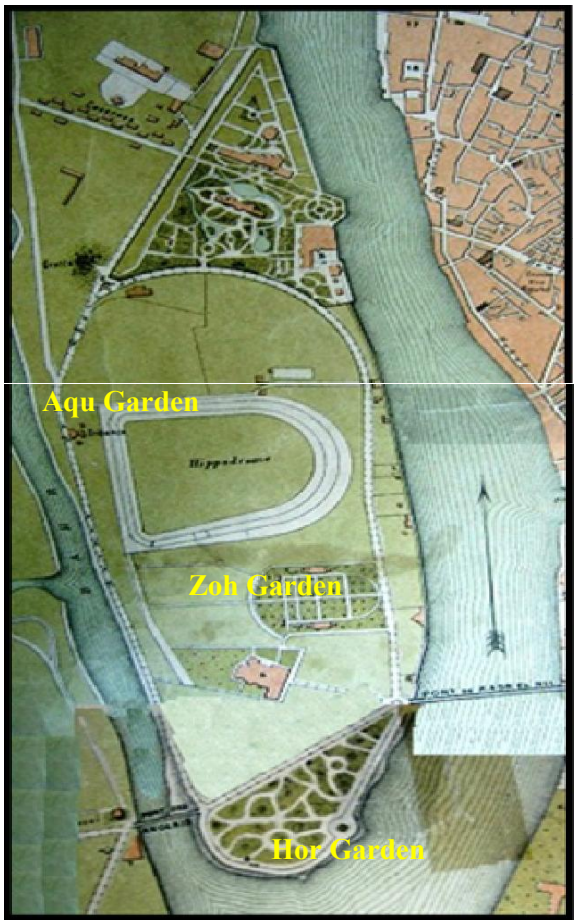

Figure 2. Historical map of Gezira Island showing the proportion of gardens and green lands.Plan Géneral de la ville du Caire et des environs, Scale 1/10.000, 1897.

Figure 3. A map showing the Location of the three major gardens of the Gezira Island, published by the Survey of Egypt, Scale 1/10.000, 1929.

Figure 4. Satellite image of the Gezira gardens showing the present status of the gardens in Gezira Isalnd, Google Earth.

tains many rare and uncommon plants (Abbass, 1929). Our study revealed that a total of 358 species are recorded in this garden and belong to 86 families and 250 genera of the seed plants. In general, the most species - rich families are Leguminosae (40 species), Palmae (30), Moraceae (17), Araliaceae (15) and Bignoniaceae (15), Myrtaceae (12) and Araceae (12), Anacardiaceae (10), Acanthaceae (10), Apocynaceae and Verbenaceae (10). Fifty one families contain only 1-2 species, among them Adiantaceae, Aloaceae, Salicaceae, Simaroubiaceae and Ulmaceae. Seven families: Aspleniaceae, Betulaceae, Hamamelidaceae, Ochnaceae, Polypodiaceae, Ranunculaceae and Theaceae are represented only in this garden. The genera that contain the most number of species are *Ficus* (13), *Clerodendrum* (7), *Dracaena* and *Schefflera* (5 for each), *Senna*, *Livistona*, *Jasmi-num*, *Terminalia*, *Justicia* and *Pistachia* (4 for each). It is noted that 240 genera contain 1-3 species only, examples of these species are: *Syzygium*, *Ligustrum*, *Chamaedorea*, *Howea*, *Sabal*, *Acanthus*, *Barleria*, *Sanchesia* and *Nolina* were recorded.

Twelve growth forms have been observed in this garden. Trees, shrubs, climbers, palms and perennial herbs are the most common growth form. Altogether 139 trees belonging to 37 families have been recorded; the most common are Leguminosae (29 species), Moraceae (17 species), Myrtaceae and Anacardiaceae (10 species). Twenty-six families comprised the main bulk of the 84 recorded shrubs; Araliaceae (11 species), Leguminosae (9 species), Acanthaceae (8 species) and Rubiaceae (7 species). Climbers are among the characteristic features of the Zohriya gar-

den; they include 34 species or 10% of the total recorded species and belong to 19 families and 26 genera. The palm trees are comprised of 30 species representing 20 genera; the most important are: *Livistona* (4 species), *Sabal* (3 species), *Phoenix*, *Washingtonia*, *Roystonea* and *Chamaedorea* (2 species). Nineteen perennial herbs belonging to 13 families have been recorded, of which three belong to each of Liliaceae and Compositae and two species to each of Labiatae and Zingiberaceae. It is to be noted that, among the rare ferns: *Pteris cretica*, *Polypodium vulgare* and *Phanerophlebia falcata* were recorded in the Zohriya garden.

The Aquarium (Fishes) garden (Aqu)

History and structure

The Aquarium (Fishes) garden was established in 1871 on 10 Feddans of the Khedive's Ismail private property on the western side of the Gezira island (Figures 2 and 3). The grottos were constructed by the well known Italien specialists: De Combaz and Dumilieu. In the early 1900's, Captain Stanley Flower constructed the Fishes Garden; as he added aquariums in the old grottos of the garden, it became home of a rare collection of African fishes and reptiles. It was one of the only gardens created in the 19th century that was actually designed to be a public park.

Landmarks and floral composition

The rocky feature of its design and its rounded shape surrounded by Pine, Casuarina and Palm trees are very remarkable. The Fishes garden (now 9.5 Feddans; Figure 4) was rehabilitated and reconstructed in 2000; damaged parts were rebuilt while retaining all original features.

A total of 95 species were recorded in the Aquarium belonging to 37 families and 68 genera of seed plants. Generally, the most species-rich families are Palmae (13 species), Moraceae (12 species), Agavaceae (8 species), Leguminosae (7 species), Euphorbiaceae and Verbenaceae (5 species each), and Apocynaceae (4 species), Cupressaceae and Pinaceae (3 species each). Twenty-eight families are represented by 1-2 species; amongst others, these families include Acanthaceae, Aloaceae, Anacardiaceae, Araceae, Araucariaceae, Bignoniaceae, Bombacaceae, Cannaceae, Geraniaceae, Labiatae, Lytharaceae, Meliaceae, Punicaceae, Sapindaceae and Sterculiaceae. The genera most rich in species are *Ficus* (10 species), *Agave* (4 species), *Furcraea*, *Pinus* and *Sabal* (3 species each). Nine genera are represented by included only two species; these are: *Justicia, Cupressus, Acalypha, Erythrina, Bougainvillea, Caryota, Phoenix, Washingtonia* and *Brachychiton.*

Ten different growth forms have been observed in the Aquarium. Trees, shrubs, palms, succulents and conifers are among the well-represented forms. Thirty-four trees belonging to 15 families are found; of which 12 species belong to the Moraceae and five species to the Leguminosae. In the mean time, 16 species of shrubs are recorded; these represent eight families, mostly represented by Verbenaceae, Apocynaceae and Euphorbiaceae. Palms also are of remarkable contribution to the floristic diversity of this peculiar garden; 13 palm- trees or 14% of the total recorded species are found in this garden belonging to eight genera of the Palmae. These include three species of *Sabal* and two species of each of *Phoenix, Washingtonia* and *Caryota*. On the other hand, succulent species were represented by eleven species belonging to three families; of which Agavaceae contributed with eight species of *Agave* (4 species), *Furcraea* (3 species) and *Sansevieria* (one species). Altogether seven species contributed mostly to the gymnosperm collection in this garden, these include three species of each of Cupressaceae and Pinaceae and one species of Araucariaceae (*Araucaria bidwillii*).

The Ezbekiya garden (Ezb)

History and structure

On his return from Paris in 1868, the Khedive Ismail instructed M. Barillet DeChamps; a French landascape gardener; to reconstruct the Ezbekiya garden on the style of Paris parks. For this reason, the Ezbekiya garden resembled the octagonal shape of 'Parc Monceau" (Andariah, 1933) with its four gates (Figures 5 and 6). This garden was formerly a lake dug by Prince Azbak in 1475. When Mohamed Ali became a ruler of Egypt, he ordered Burhan Bey to transform Ezbekiya and its lake into a park (Osman, 1933). With the help of Delchevalerie, the garden was ready in 1872.

Landmarks and floral composition

The total area of the Ezbekiya garden at the time of its reconstruction was 20 Feddans but now it has reduced to 10.6 Feddans, and becomes irregular in shape (Figure 6). Its main landmarks include an artificial Grotto with water falls, a small mountain cultivated with *Agave* and some cacti, the marble fountain decorated with botanical motifs, the water from the fountain runs in a short canal ending with a small lake. At its left side there is a Royal rest topped by an iron ancient crown. At the western side,

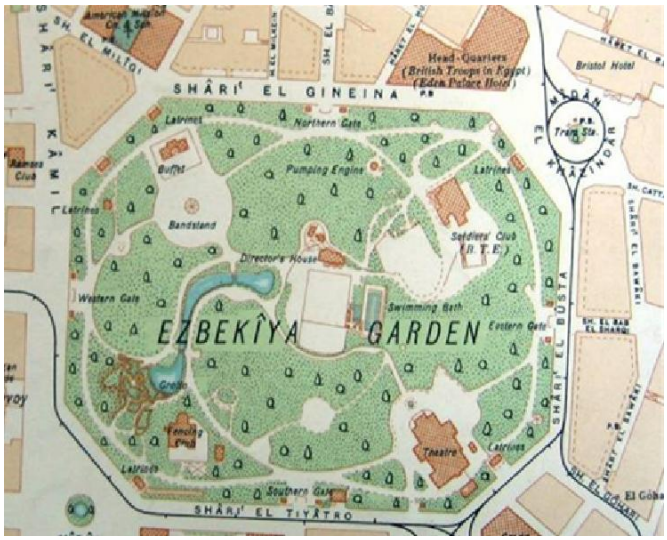

Figure 5. Historical map shows the structure and landmarks of Ezbekiya garden, published by the Survey of Egypt, Scale 1/5.000, 1927.

Figure 6. A satellite image of the Ezbekiya garden shows the decrease in its area

the remains of the mounds and caves, which are planted nowadays with succulent and desert plants are found. There is also a music kiosk established at the same place of the ancient one (Mohamed, 2004). The Ezbekiya garden has low species diversity compared with the other gardens. A total of 114 species belonging to 37 families and 68 genera of seed plants have been recorded in this garden. In general, the most species-rich families are Moraceae (17 species), Palmae and Leguminosae (13 species each), Agavaceae (9 species), Verbenaceae (6 species), Euphorbiaceae (5 species), Bignoniaceae, (4 species), Pinaceae, Anacardiaceae and Malvaceae (3 species each). However, 27 families are represented by 1-2 species; amongst others, these families include Bombacaceae, Oleaceae, Myrtaceae, Labiatae, Lythraceae, and Rutaceae. The genera represented by high number of species were: *Ficus* (16 species), *Phoenix* and *Agave* (4 species each), *Pinus* and *Euphorbia* (3 species each), *Hibiscus, Washingtonia, Prunus, Citrus* and *Brachychiton* (2 species each). Eight different growth forms have been observed for the plants cultivated in the Ezbekiya garden. Trees, shrubs, palms, succulents, perennial herbs and climbers were among the well-represented forms. The recorded 54 trees represent 47% of the total recorded species, and belong to 16 families; of which the most common are Moraceae (17 species), Leguminosae (11 species), Bignoniaceae (4 species) and Anacardiaceae (3 species). Thirteen palm-tree species belonging to 8 genera of the Palmae are found in this garden e.g., *Hyphaena, Livistona, Phoenix, Rhapis* and *Roystonea*. Eight climbers and perennial herbs are also recorded the Ezbekiya garden.

The Zoo garden (Zoo)

History and structure

The Zoo is located near the west bank of the river Nile, its northern side facing the Orman garden and overlooks Cairo University. This place was formerly occupied by a small house and a garden that belonged Said Pasha, but was demolished after Khedive Ismail built the palatial residence, which with its courts and annexes covered an area of 6 Feddans. Ismail had wished to open this garden on the occasion of the inauguration of the Suez Canal in 1869, but that was not possible. The palace was finished in 1875, but the garden was not completed. The completion of the work was entrusted to Delchevalerie who had several Europaean assistants, in addition to the chief Egyptian native gardener Ibrahim Hamooda. In 1890, during the reign of Khedive Tawfik, about 50 Feddans were taken from the Giza Khedivial Gardens (200 Feddans) to establish the Zoo (Flower, 1903). With the construction of the Cairo University Street in 1938, another 29 Feddans were added to its area that reached 80 Feddans (El-Tarabily, 2003) (Figures 7 and 8).

Landmarks and floral composition

The garden is characterized by its natural style, with its distinguished landmarks and sites, its walks are paved with colored pebbles looking like sugar coated almonds laid out in Arabesque and Roman mosaic. The garden is

Figure 7. Historical map showing the Giza gardens before splitting into the Zoo and the Orman gardens, published by the Survey of Egypt, Scale 1/10.000, 1929.

Figure 8. A satellite image showing the present status of the Zoo and the Orman gardens. Note Cairo University Street between the two gardens

divided into three parts with their peculiar landmarks:
(1)The Northern part (The Haremlik) with the Haremlik lake, the marble fountain, the Cactus garden, the Tea island, the Band mark, a part of the gate of Haremlik palace, the Grotto of creativity created by De Combaz (1873 - 1875), the Citadel Grotto created by Sipoz in 1867 and decorated with various statues of extinct Fayum rhinoceros, crocodiles and birds, it is surrounded by a lake where we can see Blue Lotus; (2) The Southern part (The Selamlik) with the Selamlik lake, a Cactus garden, the Sham'idan Grotto created by Sipoz in 1869, The Chinese kiosks, The Pagoda (Japanese kiosk), The Royal rest, the two artificial hills cultivated by a forest of *Quercus*, *Casuarina* and Pine connected together by an old and seldom suspended pedestrian bridge built by Gustave Alexandre Eiffel, and brought to Cairo when Khedive Ismail visited the Paris Exhibition, the Animal Museum (1906), in addition to other three grottos; and
(3) The part of Orman garden that was added in 1938.
A total of 325 species representing 68 families and 220 genera of vascular plants have been recorded in the Zoo gardens. In general, the most species-rich families are Leguminosae (47 species), Moraceae (20 species), Euphorbiaceae (16 species), Palmae (15 species), Bignoniaceae (13 species), Anacardiaceae and Myrtaceae (12 species each), Verbenaceae and Agavaceae (10 species each). Thirty-six families comprised only 1-2 species, the most common of these families are: Aceraceae, Adiantaceae and Aloaceae. The genera richest in species are *Ficus* (18 species), *Euphorbia, Albizia and Terminalia* (6 species each), *Acacia* and *Cordia* (5 species each), *Pistacia, Schinus, Aloe and Annona* (4 species each).

Thirteen different growth forms are noticed in this garden that range between trees and perennial herbs. Trees, shrubs, succulents, palms and climbers are among the well-represented forms. Trees represent one of the most prominent features of this garden, where 187 species belonging to 38 families have been recorded. The most common families include Leguminosae (38 species), Moraceae (20 species), Myrtaceae and Anacardiaceae (12 species each), Bignoniaceae and Meliaceae (6 species each) . Tree of *Pithecellobium dulce* (Leguminosae) was found only in this garden. On the other hand, shrubs in this garden are represented by 55 species belonging to 25 families, among the most rich families are leguminosae (8 species), Verbenaceae (5 species), Acanthaceae and Anacardiaceae (4 species

each). Succulent plants are represented by 22 species belonging to seven families, amongst them Euphorbiaceae (7 species), Agavaceae (6 species) and Aloaceae (2 species). *Euphorbia* comprised the largest number of species (6 species). *Aloe* is ranked second, and represented by four species. Palms were also of remarkable contribution to the the floristic diversity of this peculiar garden. Fifteen palm-tree species representing 11 genera of the Palmae, these include two species of each of *Livistona, Phoenix, Washingtonia* and *Caryota*.

The Orman garden (Orm)

History and structure

The Orman gardens was a part of the Giza gardens (200 Feddans), established in 1873, characterized by its natural style and covered an area of about 95.2 Feddans for supplying the Khedivial palaces with vegetables and fruits introduced from the Sicily Island, 10.000 Citrus trees were cultivated there (Delchevalrie, 1899). In 1919, the Ministry of Agriculture converted the Orman garden into a botanical garden known at that time as the "Lemon Garden" of a total area reaching 58 Feddans. Recently, the area of this garden has been diminished to 28 Feddans as 28 other Feddans were given to the Zoo garden, Cairo University and its street, Authority of the Survey of Egypt and the Giza Security Department (Figures 7 and 8).

Landmarks and floral composition

Among the major and conspicuous landmarks of this garden are the rocky garden (1.5 Feddans) containing 200 species of *Cactus* and succulents belonging to 11 famiies, the rose garden (2 Feddans), the water pond containing water plants such as: *Cyperus papyrus, Nelumbo nucifera, Nymphaea caerulea* and *Aeschynomene elaphroxylon*. It also includes a herbarium containing King Farouk I private collections of wild and medicinal plants, fifteen green houses and seed exchange unit. The plants are cultivated in the garden in 12 sections, e.g.: *Strelitzia, Ficus* and Roses.

The Orman garden is the most diversified and species rich among the studied botanical gardens. A total of 835 representing 115 families and 434 genera of the seed plants. The families that comprises high number of species are Cactaceae (74 species), Leguminosae (68 species), Agavaceae (55 species), Palmae (54 species), Euphorbiaceae (41 species), Moraceae (37 species), Aloaceae (25 species), Crassulaceae (21 species), Bignoniaceae (20 species) and Verbenaceae (20 species). In addition 57 families comprise 1-2 species; amongst others, these families include Guttiferae, Magnoliaceae, Podocarpaceae and Vitaceae. There is a suite of 24 families represented only in this garden, amongst others, these include Asphodelaceae, Berberidaceae, Cephalotaxaceae, Ginkgoaceae, Myrsinaceae, and Nymphaeaeceae. The genera richest in species are *Ficus* (31 species), *Agave* and *Euphorbia* (23 species each), *Opuntia* (21 species), *Aloe* (15 species), *Kalanchoa* (11 species), *Ferocactus, Clerodendrum, Yucca and Erythrina* (8 species each), and *Cupressus* (6 species).

Fourteen different growth forms were observed in the Orman garden, trees, succulents, shrubs, cacti, climbers and perennial herbs are among the well-represented forms. Trees are represented with 250 species belonging to 45 families, Leguminosae, Moraceae, Bignoniaceae, Myrtaceae, Sapotaceae and Anacardiaceae are the families with high number of species. Cold region trees, for instance, include *Pinus canariensis*, *Sequoia sempervirens* and *Cephalotaxus fortunii*. Tropical region trees such as *Khaya, Tectona, Spathodea, Tabebuia, Bixa, Euclea* and *Antidesma* are also grown in this garden. According to their uses, trees of this garden can be organized into the following categories: (a) Fibre trees such as *Ceiba pentandra* (Kapok tree), from which kapok fiber is used in protecting devices against break and *Bombax ceiba* (Red silk-cotton tree); its cotton is used for stuffing pillows and its inner bark yields a fiber used in making ropes, as well the fiber of *Adansonia digitata*. (b) Oil trees such as *Jatropha curcas* (Petroleum tree), in which the seed oil can be used in soap industry. The seeds of *Aleurites moluccana* (candle-nut or varnish tree) have a high percentages of oil used in making margarine, candle and grease industry (Haggag, 1931). (c) Medicinal tree plants such as *Pimenta racemosa* (rum -tree), its leaves and bark can be used as spices. The oil extracted from the leaves is used in the industry of perfumes (Marei 1970). The dyes extracted from *Bixa orellana* (annatto-rouge tree) are used in expulsion of insects, coloring of butter, cheese and some textiles. The extraction of leaves and roots are used in curing from epilepsy and dysentery diseases. The volatile oil that is extracted from *Cinnamomum camphora* (camphor tree) consists of important substances such as camphor, eugenoide and terpinole that used as disinfected material, and in ointments industry. (d). Tropical fruit trees include some genera such as *Casimiroa*, *Artocarpus, Spondias, Carica, Persea, Diospyros, Hyphaena, Eugenia* and *Macadamia*. The rare *Atrocarpus hetero-phyllus* (Jake fruit) is a multi-purpose tree. Its wood is solid, shining and resistant to insects. It is used in

building of houses and furniture, the wood of old roots is also used in sculpture. The powder of wood can be used in dyeing of clothes. The fruits are well-tasteful and contain many vitamins and mineral elements. *Eugenia uniflora* (Surinam cherry) is another rare tree which its fruits can be used in jelly and jam manufacture. The extraction of leaves is used to kill insects. (e) Woody trees include genera such as *Tectona, Khaya, Euclea, Dalbergia, Tipuana, Cassia, Terminalia, Eucalyptus, Taxodium, Acrocomia, Euphor-bia, Cordia, Bauhinia, Ulmus, Pterocarpus, Grevillea* and *Quercus.*

The section of succulent plants is remarkable and peculiar, and represents one of the most prominent features of this garden. Twelve families comprise the succulent plants with 140 species: Agavaceae (45 species), Euphorbiaceae (28 species), Aloaceae (25 species), Crassulaceae (21 species) and Aizoaceae (7 species). *Euphorbia* and *Agave* are the largest genera of succulent plants (23 species).

The floristic diversity among shrubs is noticeable: Shrubs comprise 137 species or 16% of the total recorded species, they belong to 41 families, the most common of which are Verbenaceae (15 species), Leguminosae (14 species), Araliaceae (11 species), Euphorbiaceae (9 species), Solanaceae and Malvaceae (8 species each) as well Rosaceae (7 species). The cactus section that covers an area of about 1.5 Feddans is among the characteristic features of the Orman botanic garden. It is interesting to note that 74 cactus species are recorded in this garden. The cacti are comprised of 24 genera were found, of which *Opuntia* includes the largest number of species (21 species) followed by *Ferocactus* (8 species). Other genera are represented by only 3 - 4 species; e.g. *Cleistocactus*, *Coryphantha* and *Mammillaria* (4 species each), *Cereus* and *Echinocactus* (3 species each).

Forty- seven climbers plant species belonging to 24 families were recorded. The most rich families with regard to the number of climber species are Bignonia-ceae (6 species), Oleaceae (5 species), Nyctagina-ceae (4 species), Apocynaceae, Solanaceae and Convolvulaceae (3 species) . Among the rare species of climbers in this garden are *Carrisa macrocarpa, Hoya carnosa, Anredera cordifolia, Hiptage madablota, Passiflora edulis, Asparagus setaceus* and *Aristolochia elegans* were observed. Among other common climbers *Antigonon leptopus, Argyreia nervosa, Bougainvillea glabra, Cardiospemum halicacabum, Clerodendrum splendens, Hedera helix* and *Lonicera japonica* were recorded. An equal number of species
(47) of perennial herbs have been representing 19 families, that include: Compositae (11 species), Labiatae (6 species), Zingiberaceae (5 species), Lilia-ceae (4 species) and Acanthaceae (3 species).

The Horreya garden (Hor)

History and structure

The Horreya garden is the third compartment of the Gezira Island, one of the last gardens established by Khedive Ismail in 1876. It is located between Kasr El Nil and Abbas Bridge with a total area of 28.7 Feddans (Figures 2 and 3). It was rehabilitated and recons-tructed in 1999, opened to the public in 2001 with an area of 7 Feddans. As major parts were taken by: Cairo club (8 Feddans in 1936), Mokhtar Museum (0.06 Feddanns in 1953), Presidential guards (11 Fed-dans in 1970) and finally Sheraton El Gezira Hotel (1 Feddan in 1989) (Figure 4).

Landmarks and floral composition

The style of the Horreya garden is combined of natural and formal styles. The steps and benches are decorated with fine and colorful mosaic, there are also a lot of statues belonging to Egyptian presidents and famous poets, and several kiosks. A forest of Pine, *Grevillea, Peltophorum, Ficus benghalensis* and *Ficus benjamina* trees can be also found. This is the least diversified among the six studied botanical gardens. A total of 62 species were recorded representing 29 families and 49 genera of the vascular plants. Generally, the most species-rich families are Moraceae (10 species), Leguminosae (7 species), Palmae (6 species), Myrtaceae (5 species) and Anacardiaceae (3 species). Twenty-three families are only represented by 1 - 2 species such as Bombacaceae, Cannaceae, Causarinaceae, Commelina-ceae, Geraniaceae, Malvaceae, Labiatae, Rosaceae and Pinaceae. The most rich genera include were *Ficus* (9 species), *Cassia, Eucalyptus, Washingtonia, Citrus* and *Brachychiton* (2 species each). Trees, palms, perennial herbs, shrubs and conifers were among the well-represented eight growth forms. Thirty-nine trees belonging to 15 families have been found. Moraceae, Leguminosae, Myrtaceae and Anacardiaceae are the richest families with 10, 6, 5 and 3 species, respectively. Six palm-trees grow in this garden (10% of the total recorded species) and belong to five genera of the Palmae; these comprises two species of *Washingtonia* and one species of *Phoenix, Roystonea, Sabal* and *Syagrus*. Six species of perennial herbs are found in the Horreya botanical garden, these species belong to six families, Cannaceae, Commelinaceae, Compositae, Labiatae, Liliaceae and Zingiberaceae. As well four species of shrubs belonging

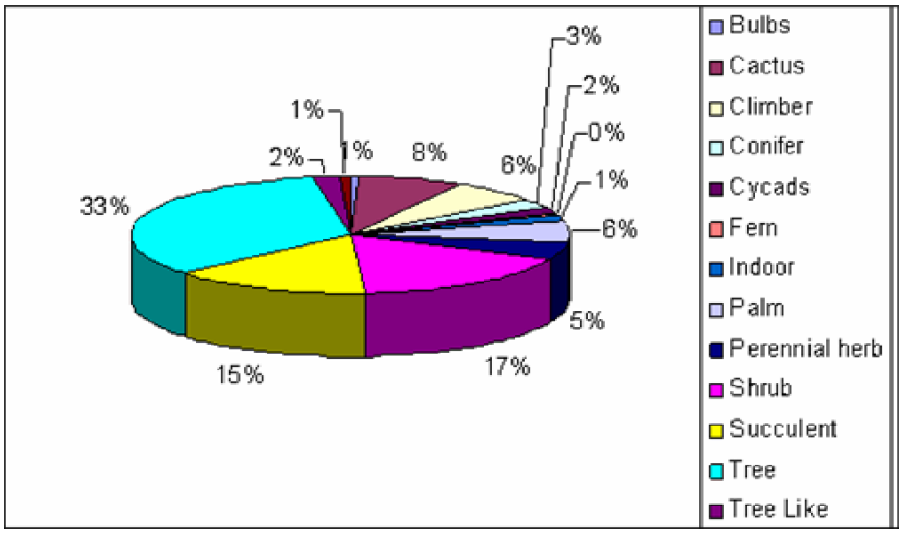

Figure 9. Distribution of the growth forms for the species recorded in the studied gardens

to four families: Malvaceae (2 species), Apocynaceae, Lythraceae and Sapotaceae (one species each).

General distribution patterns of species

The flora in the six studied gardens consists of 962 species of vascular plants that belong to 490 genera and 125 families (see Appendix). The most species-rich gardens is the Orman (835), followed by Zohriya (358) and the Zoo (325), while the lowest number is found in the Horreya garden (62). Generally, the most species-rich families are Leguminosae (86 species), Cactaceae (74), Palmae (56) and Euphorbiaceae (45), whereas Myrtaceae, Crassulaceae, Apocynaceae and Acanthaceae comprise the lowest number of species (21, 21, 18 and 17 species respectively). Species of 19 families (Anacardiaceae, Apocynaceae, Bignoniaceae, Compositae, Geraniaceae, Labiatae, Leguminosae, liliaceae, Lythraceae, Malvaceae, Moraceae, Myrta-ceae, Palmae, Rutaceae and Sapindaceae) are widely distributed and represented in all the studied gardens. In the mean time 29 families are confined to either the Orman garden (24) or the Horreya (5). The genera most rich in species is *Ficus* (35 species), followed by *Euphorbia* (24), *Agave* (22) *Opuntia* (21), *Aloe* (16) and *Clerodendrum* (9). However, certain genera showed limited occurrence in a single garden, particularly in the Orman, examples of these genera include *Yucca, Sansevieria, Opuntia, Kalenchoa, Ferocactus* and *Epiphyllum*.

Our results revealed that each garden is charac-terized by a number of species that do not occur in the others (Appendix). Four hundred species occur in Orman, 55 in Zohriya garden, 33 in the Zoo, three in Ezbekiya, and two in each of the Aquarium and Horreya.

Despite the lack of information on the old floristic composition of the studied botanical gardens, the available data of the previous studies throughout the 19th century can be observed in the Appendix (marked by asterisk). Altogether, 494 species of the recorded taxa represented the old records in these gardens, and distributed as follows: 245 in Zohriya,, 65 in Aquarium, 77 in Ezbekiya, 220 in the Zoo, 314 in Orman and 40 in Horreya.

Figure 9 shows that trees are the dominant growth form for the plants in the examined gardens (36%), followed by shrubs (17%) and succulents (15%). The spatial distribution of these growth forms in the studied gardens is shown in Table 2. It is to be noted that all the recognized growth forms are represented in the Orman garden. Meanwhile climbers, conifers, palms, perennial herbs, shrubs, trees, and tree-like forms are recorded in all the studied gardens. Remarkably, cacti are confined to Orman garden and the Zoo. The highest number of cactus species (74) has been recorded in the Orman garden, as it includes the oldest and well preserved collection of cacti from all over the world. Only seven cacti have been found in common in the Orman gaden and the Zoo. (e.g., *Cereus uruguayanus, Echinocactus grusonii, Opuntia dejecta* and *Cleistocactus winteri*). It is also on interest to note that, of the recorded 25 conifer species 15 species are found in common in the Orman and the Zohriya gardens. Ferns (5 species) have been found well-

Table 2. Distribution of the major growth forms in the studied gardens. Abbreviations of gardens names: Zoh=Zohriya, Aqu=Aquarium, Ezb=Ezbekiya, Orm=Orman and Hor=Horre

Life Form	Zoh	Aqu	Ezb	Zoo	Orm	Hor
Bulbs	2	0	0	0	5	0
Cactus	0	0	0	6	74	0
Climber	34	4	8	14	47	1
Conifer	15	7	4	1	25	3
Cycads	5	0	0	1	16	1
Fern	5	0	0	1	1	0
Indoor	11	1	0	4	13	0
Palm	30	13	13	15	54	6
Perennial herb	19	6	8	13	47	6
Shrub	84	16	14	55	137	5
Succulent	2	11	12	22	140	0
Tree	139	34	54	187	249	39
Tree-like	11	2	1	4	20	1
Water plant	1	1	0	2	7	0
Total number of species (present)	**358**	**95**	**114**	**325**	**835**	**62**
Total number of species (old)	**245**	**265**	**77**	**220**	**314**	**40**

Table 3. Simple matching similarity coefficients between the species composition in the studied gardens. For abbreviations, see Table 2.

Gardens	Zoh	Aqu	Ezb	Zoo	Orm
Zoh					
Aqu	0.54				
Ezb	0.56	**0.86**			
Zoo	**0.70**	0.62	0.66		
Orm	0.62	0.34	0.38	0.58	
Hor	0.51	**0.86**	**0.87**	0.62	0.31

represented in the Zohriya garden but are rarely found in other gardens, these are *Adiantum capillus-veneris, Pteris cretica, Polypodium vulgare, Nephrolepis exeltata* and *Cyrtomium falcatum*. The Orman and the Zohriya gardens share a considerable number of species (273) represented by different growth forms. These species include 30 palms, 11 indoor plants and two bulbs.

As expected, the Orman garden and the Zoo share 262 of the recorded species, amongst others, *Rham-nus cathartica, Opuntia dejecta, Cleistocactus strausii*, *Euphorbia abyssinica*, *Fraxinus angustifolia* and *Montanoa bipinnatifida*. This can be explained on a historical background as both gardens comprised together the Giza gardens before their splitting, and the frequent exchange of species between them. The correlation coefficients between the species composi-tion in both gardens is relatively low (Table 3).

Similarly, 229 species are common to the Orman and the Zohriya gardens and the Zoo. This may be due to the regular exchange of plants between these three gardens. However, no common species are found in the other three gardens (Ezbekiya, Aquarium and Horreya). The results given in Table 3 clearly show that the correlations between these three gardens is high.

The absence of plant exchange with other gardens may lead to a substantial reduction of the cultivated area. This may leads to the deterioration of our Egyptian historical botanical assets.

The cluster analysis of the data on the examined gar-

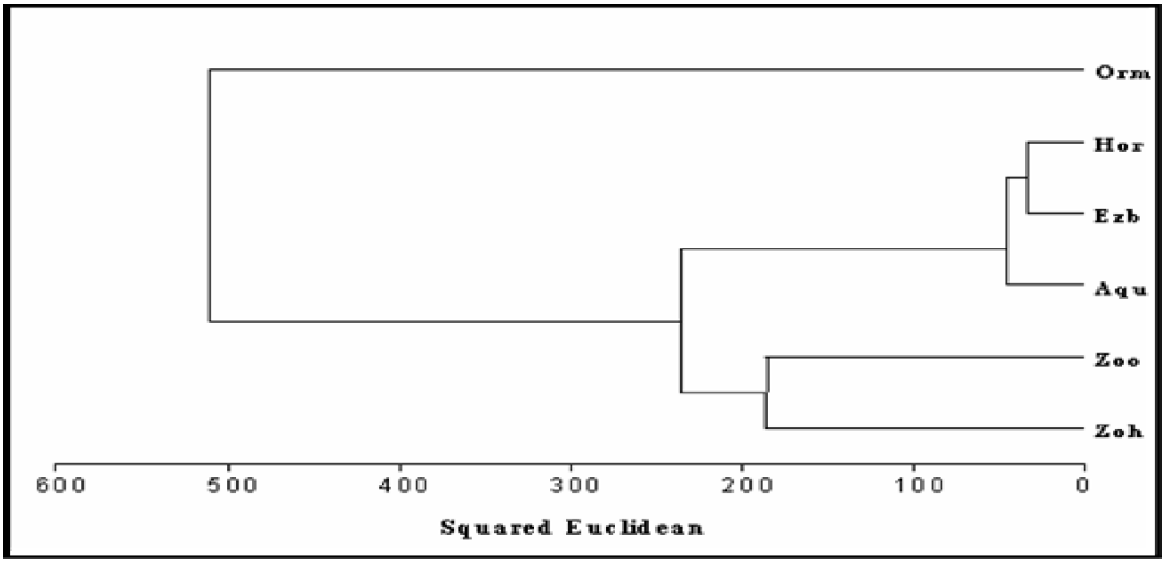

Figure 10. Cluster analysis dendrogram of the studied gardens

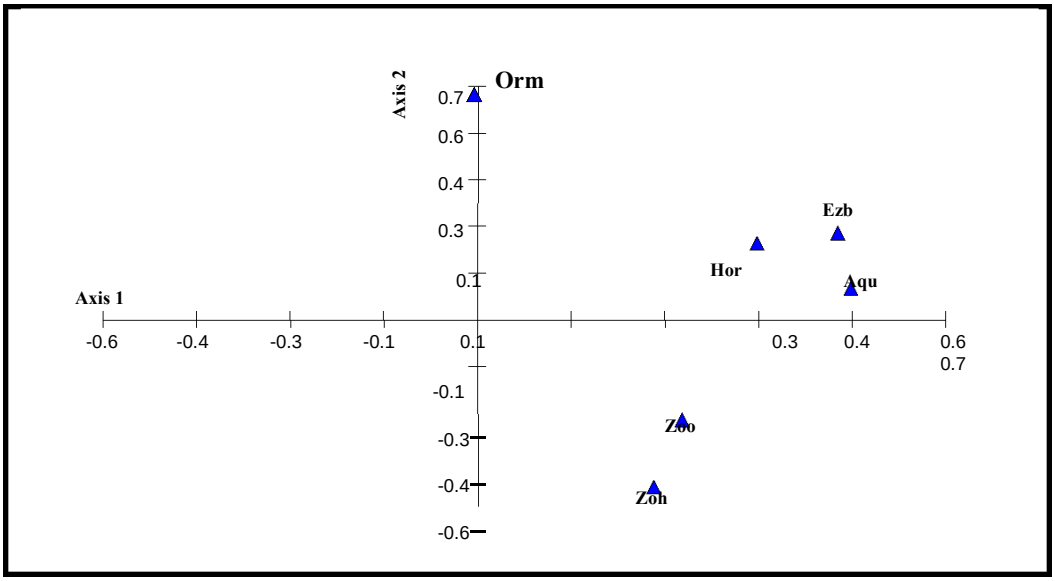

Figure 11. Prinicipal Coordinates Analysis (PCoA) of the six gardens, with three groups clearly separated along axes 1 and 2.

dens (Figure 10), based on the frequency of species, clearly segregated the studied historical botanical gardens into 3 groups. The Orman garden is clearly separated from another two groups, one comprising the Horreya, the Ezbekiya and the Aquarium gardens and the other includes the Zohriya and the Zoo. This classification of the examined gardens is confirmed by the Principal Coordinate Analysis (PCoA; Figure 11).

ACKNOWLEDGEMENTS

We thank Prof. Dr. Reinhard Bornkamm, Institute of Ecology and Biology, Technical University, Berlin, Germany for reading and commenting on the manuscript. Special thanks also to Eng. Essam A. Gawad, who took the responsibility in formatting and tabulating all the maps, figures, tables and represented data. We thank

Appendix. Floristic composition of the six studied historical botanic gardens in Cairo city. * :old species still grown.

Family	Zoh	Aqu	Ezb	Zoo	Orm	Hor	Life Form
Acanthaceae							
Acanthus mollis L.*	+*						Shrub
Anisacanthus virgularis Nees*				+*	+*		Shrub
Barleria cristata L.*	+*			+*	+*		Shrub
Eranthemum pulchellum André*	+*				+*		Shrub
Justicia adhatoda L.	+*	+*	+*	+*	+*		Shrub
Justicia brandegeana Wassh. & L.B. Sm.*	+*						Shrub
Justicia carnea Lindl.*	+*						Shrub
Justicia ghiesbreghtiana Lem.*	+*	+*		+*	+*		Shrub
Pachystachys lutea Nees*					+*		Shrub
Pseuderanthemum atropurpureum L.H. Bail.*					+*		Shrub
Ruellia brittoniana Leonard					+		Perennial herb
Ruellia tuberosa L.					+		Perennial herb
Sanchesia speciosa Leonard	+						Shrub
Strobilanthes dyeramus Mast.					+		Perennial herb
Thunbergia erecta (Benth.) Anderson					+		Climber
Thunbergia grandiflora (Roxb.ex Rott.)Roxb.*	+*						Climber
Thunbergia grandiflora (Roxb.ex Rott.)Roxb. 'Alba'*	+*						Climber
Aceraceae							
Acer negundo L.*				+*	+*		Tree
Acer oblongum Wallich ex DC.*				+*	+*		Tree
Adiantaceae							
Adiantum capillus-veneris L.	+*			+*			Fern
Pteris cretica L.	+*						Fern
Agavaceae							
Agave americana L.*			+*		+*		Succulent
Agave americana L. 'Striata'		+		+	+		Succulent
Agave americana L.'Marginata'		+		+	+		Succulent
Agave americana L.'Medio picta'					+		Succulent
Agave angustifolia Haw.*		+*	+*	+*	+		Succulent
Agave angustifolia Haw. 'Marginata'					+		Succulent
Agave attenuata Salm-Dyck.*					+*		Succulent
Agave celsii Hook.*					+*		Succulent
Agave decipiens Bak.					+		Succulent
Agave desmettiana Jacobi					+		Succulent
Agave ferox Koch.*		+*	+*		+*		Succulent
Agave filifera Salm-Dyck.*					+*		Succulent
Agave franzosinii Bak.					+		Succulent
Agave heteracantha Zucc.*					+*		Succulent
Agave lophantha Schiede.					+		Succulent
Agave lophantha Schiede.'Poselgeri'					+		Succulent
Agave macroacantha Zucc.*					+*		Succulent
Agave micracantha Salm-Dyck.					+		Succulent

Appendix. Contd**.**

Agave parviflora Torr.					+		Succulent
Agave sisalana Perr.ex Engelm			+		+		Succulent
Agave striata Zucc.					+		Succulent
Agave victoria-reginae T. Moore.					+		Succulent
Agave weberi Cels ex Poiss.					+		Succulent
Cordyline indivisa (Forst.) Steud.*			+*		+*		Tree like
Cordyline *terminalis* (L.) Kunth.*	+*			+*	+*		Tree like
Cordyline terminalis (L.) Kunth. 'Red edge'*	+*			+*	+*		Tree like
Dracaena deremensis Engl.					+		Tree-like
Dracaena deremensis Engl. 'campacta'					+		Tree-like
Dracaena draco (L.) L.*	+*				+		Tree-like
Dracaena fragrans (L.) Ker-Gawl.	+				+		Tree-like
Dracaena fragrans (L.) Ker-Gawl. 'Massangeana'	+			+	+		Tree-like
Dracaena marginata Lam.	+				+		Tree-like
Dracaena reflexa (Decne.) Lam.	+			+	+		Shrub
Furcraea foetida (L.) Haw.		+		+	+		Succulent
Furcraea foetida (L.) Haw. 'Mediopicta'		+		+	+		Succulent
Furcraea selloa K.Koch.		+	+	+	+		Succulent
Furcraea selloa var. *marginata* Trel.					+		Succulent
Nolina longifolia (Schult.&Schult.f.))Hemsl.					+		Succulent
Nolina recurvata (Lem.) Hemsl.*					+*		Succulent
Sansevieria cylindrica Bojer.					+		Succulent
Sansevieria ehrenbergii Schweinf ex Bak.					+		Succulent
Sansevieria guineensis (L.) Willd.		+			+		Succulent
Sansevieria trifasciata Prain.			+		+		Succulent
Sansevieria trifasciata Prain. 'Hahnii'					+		Succulent
Sansevieria trifasciata Prain.'Golden Hahnii'					+		Succulent
Sansevieria trifasciata Prain. 'Laurentii'					+		Succulent
Sansevieria trifasciata Prain.'Silver Hahnii'					+		Succulent
Yucca aloifolia L.					+*		Succulent
Yucca desmettiana Bak.					+		Succulent
Yucca elephantipes Regel.			+		+		Succulent
Yucca filamentosa L.					+		Succulent
Yucca filamentosa L. 'Variegata'					+		Succulent
Yucca glauca Nutt ex J. Fraser					+		Succulent
Yucca gloriosa L.			+		+		Succulent
Yucca recurvifolia Salisb.					+		Succulent
Aizoaceae							
Aptenia cordifolia (L.f.) Schwantes				+	+		Succulent
Carpobrotus edulis (L.) L.Bol.				+	+		Succulent
Faucaria tuberculosa (Rolfe) Schwantes					+		Succulent
Glottiphyllum linguiforme (L.) N.E.Br.					+		Succulent
Lampranthus aureus (L.) N.E.Br.					+		Succulent
Lampranthus spectabilis (Haw.) N.E.Br.					+		Succulent
Oscularia caulescens (Mill.) Schwantes					+		Succulent

Appendix. Contd**.**

Aloaceae							
Aloe arborescens Mill.*				+*	+*		Succulent
Aloe barbadensis Mill.	+			+	+		Succulent
Aloe brevifolia Mill.					+		Succulent
Aloe camperi Schweinf.					+		Succulent
Aloe ciliaris Haw.					+		Succulent
Aloe dichotoma Masson.		+					Succulent
Aloe ferox Mill.					+		Succulent
Aloe grandidentata Salm-Dyck.					+		Succulent
Aloe marlothii A.Berger.					+		Succulent
Aloe melanacantha A.Berger.					+		Succulent
Aloe mitriformis Mill.				+	+		Succulent
Aloe saponaria (Ait.f.)Haw.					+		Succulent
Aloe sp.				+	+		Succulent
Aloe spinosissima Hort. ex A. Berger.					+		Succulent
Aloe striata Haw.					+		Succulent
Aloe variegata L.					+		Succulent
Gasteria bicolor Haw.					+		Succulent
Gasteria disticha (L.) Haw.					+		Succulent
Gasteria liliputana Poelln.					+		Succulent
Gasteria verrucosa Duval					+		Succulent
Haworthia attenuata Haw.					+		Succulent
Haworthia coarctata Haw.					+		Succulent
Haworthia cymbiformis (Haw.)Duval					+		Succulent
Haworthia fasciata (Willd.) Haw.					+		Succulent
Haworthia limifolia Marloth.					+		Succulent
Haworthia reinwardtii (Salm-Dyck.) Haw.					+		Succulent
Amaryllidaceae							
Crinum amabile Donn	+				+		Bulbs
Crinum bulbispermum (Burm.)Milne-Redh. & Schweick.	+				+		Bulbs
Crinum moorei Hook.f.					+		Bulbs
Hippeastrum vittatum (L'Hér.)Herb*					+*		Bulbs
Tulbaghia violacea Harv.					+		Perennial herb
Anacardiaceae							
Harpephyllum caffrum Bernh.ex K.Krause*			+*	+*	+	+*	Tree
Lithrea brasiliensis Marchand.*	+*						Tree
Mangifera indica L.*	+*	+*	+*		+*	+*	Tree
Pistachia chinensis Bunge*	+*			+*	+*		Tree
Pistachia khinjuk Stocks*	+*			+*			Tree
Pistachia lentiscus L.*	+*			+*			Tree
Pistacia sp.	+			+			Tree
Pleiogynium timoriense (DC.)Leenh.*	+*			+*	+*	+*	Tree
Schinus molle L.*				+*	+		Tree
Schinus polygamus (Cav.) Cabr.*				+*	+		Tree

Appendix. Contd**.**

Schinus terebinthifolius Raddi.*	+*	+*	+*	+*			Tree
Shinopsis balansea Engl.*	+*						Tree
Shinopsis laurentzii (Griseb.)Engl.*	+*						Tree
Spondias cytherea Sonn.*				+*	+		Tree
Spondias mombin L.*				+*	+		Tree
Annonaceae							
Annona cherimola Mill.*				+*	+*		Tree
Annona glabra L.				+	+		Shrub
Annona montana Macfady*				+*	+*		Shrub
Annona muricata L.*				+*	+*		Shrub
Miliusa roxburghii (Wall.ex Griff.)Hook.f.&Thoms.				+	+		Tree
Polyalthea longifolia (Sonn.)Thw.*	+*				+		Tree
Polyalthea longifolia (Sonn.)Thw. 'Pendula'					+		Tree
Apocynaceae							
Acokanthera oblongifolia (Hochst.) Codd.	+			+	+		Shrub
Adenium obesum (Forssk.) Roem. & Schult.					+		Succulent
Alstonia scholaris (L.)R.Br.*	+*			+*	+*		Tree
Beaumontia grandiflora Wallich.	+				+		Climber
Carissa carandas L.				+	+		Shrub
Carissa macrocarpa (Ecklon) A.DC.					+		Climber
Cerbera manghas L.*	+*						Tree
Kopsia fruticosa (Ker.-Gawl.) A.DC.*					+		Shrub
Nerium oleander L.*	+*	+*	+*	+*	+*		Shrub
Pachypodium lamerei Drake					+		Succulent
Plumeria rubra L.*	+*	+*		+*	+	+	Tree
Plumeria rubra L.'Acutifolia'*					+*		Tree
Plumeria rubra L. 'Red'*					+*		Tree
Tabernamontana coronaria (Jacq.) Willd.*	+*	+*			+		Shrub
Thevetia peruviana (Pers.) K.Schum.	+	+	+	+	+	+	Shrub
Trachelospermum jasminoides (Lindl.)Lem.					+		Climber
Wrightia coccinea (Loddiges) Sims*	+*			+*			Tree
Wrightia tomentosa Roem. & Sch.*	+*			+*			Tree
Araceae							
Aglaonema commutatum Schott.	+				+		Indoor
Alocasia macrorrhizos (L.) G. Don.	+			+	+		Perennial herb
Dieffenbachia amoena Bull.	+				+		Indoor
Dieffenbachia maculata Lodd.' Exotica'	+				+		Indoor
Epipremnum aureum (Lind. & André) Bunting.	+			+	+		Indoor
Monstera deliciosa Liebm.	+			+	+		Indoor
Nephthytis afzelii Schott.	+	+		+	+		Indoor
Philodendron bipinnatifidum Endl.	+				+		Indoor
Philodendron scandens K.Koch. & Sello	+				+		Indoor
Raphidophora decursiva (Roxb.) Schott.	+						Climber
Spathiphyllum commutatum Schott.	+				+		Indoor
Syngonium podophyllum Schott.	+			+	+		Indoor

Appendix. Contd**.**

Xanthosoma *violaceum* Schott.					+		Perennial herb
Zamioculcas zamiifolia (Lodd.) Engl.					+		Indoor
Araliaceae							
Hedera canariensis Willd.*	+*		+*		+		Climber
Hedera helix L.	+*		+*	+*			Climber
Meryta denhamii Seem.	+				+		Shrub
Oreopanax capitatus (Jacq.) Decne. & Planchon*	+*			+*			Tree
Oreopanax guatemalensis Decne. & Planchon*	+*						Tree
Polyscias balfouriana (Sander ex André) L.H. Bail.	+				+		Shrub
Polyscias fruticosa (L.) Harms*	+*				+		Shrub
Polyscias guilfoylei (W.Bull) L.H. Bail.	+				+		Shrub
Polyscias paniculata auct., non (DC.) Bak.					+		Shrub
Schefflera actinophylla (Endl.) Harms*	+*				+		Shrub
Schefflera arboricola (Hayata) Merr.	+				+		Shrub
Schefflera elegantissima (Veitch ex Mast.) Lowry & Frodin	+				+		Shrub
Schefflera elegantissima (Veitch ex Mast) Lowry & Frodin 'Castor'	+				+		Shrub
Schefflera Kerchoveana (Veitch.ex W.Richards) Lowry & Frodin	+						Shrub
Sciadophyllum pulchrum Hort.*	+*			+	+		Shrub
Tetrapanax papyrifer (Hook.) K.Koch.*	+*				+*		Shrub
Araucariaceae							
Agathis robusta (C.Moore ex F.Muell.)Bail.	+				+		Conifer
Araucaria bidwillii Hook.*	+*	+*		+*	+*		Conifer
Araucaria cunninghamii D.Don.*						+*	Conifer
Araucaria heterophylla (Salisb.) Franco*	+*				+*		Conifer
Aristolochiaceae							
Aristolochia littoralis L.					+		Climber
Asclepiadaceae							
Calotropis procera (Ait.) Ait. f.				+	+		Succulent
Caralluma europaea (Guss.) N.E.Br.					+		Succulent
Cryptostegia grandiflora R.Br.*	+*			+*	+*		Climber
Hoya carnosa (L.f.) R.Br.*					+*		Succulent
Huernia zebrina N.E.Br.					+		Succulent
Stapelia gigantea N.E.Br.	+				+		Succulent
Stephanotis floribunda (R.Br.) Brongn.*					+*		Climber
Asphodelaceae							
Bulbine caulescens L.					+		Succulent
Aspleniaceae							
Cyrtomium falcatum (L.f.) K.Presl.	+						Climber
Balanitaceae							
Balanites aegyptiaca (L.) Delile*				+*	+		Tree
Basellaceae							
Anredera cordifolia (Ten.) Steenis*	+*				+*		Climber

Appendix. Contd**.**

Berberidaceae							
Nandina domestica Thunb.					+		Tree
Betulaceae							
Alnus rugosa (Duroi) Spreng.*	+*						Tree
Bignoniaceae							
Amphilophium paniculatum (L.) HBK.	+				+		Climber
Campsis capreolata Hort.*	+*						Climber
Campsis radicans (L.) Seem.*	+*				+		Climber
Catalpa bignonioides Walter*	+*			+*	+		Tree
Clytostoma binatum (Thunb.) Sandrw	+			+	+		Climber
Jacaranda mimosifolia D.Don*	+*	+*	+*	+*	+*	+	Tree
Kigelia pinnata (Jacq.)DC.*			+*	+*	+*	+*	Tree
Macfadyena unguis-cati (L.) A.Gentry.*				+*	+		Climber
Markhamia acuminata Schum.ex Engl.					+		Tree
Markhamia lutea (Benth.)Schum.*	+*		+*		+*		Tree
Millingtonia hortensis L.*				+*			Tree
Newbouldia laevis (P.Beauv.)Seem.ex Bur.*	+*						Tree
Oroxylum indicum (L.)Kurz.*				+*	+		Tree
Parmentiera cereifera Seem.*	+*						Tree
Parmentiera edulis DC.*					+*		Tree
Podranea ricasoliana (Tanf.) Sprague					+		Climber
Pyrostegia venusta (Ker-Gawl.) Miers*				+*	+		Climber
Rademarchera ignea (Kurz) Steen*				+*	+		Tree
Saritaea magnifica (T.Sprague ex Steenis)Dug.	+						Climber
Spathodea campanulata Beauvois*			+*	+*	+*		Tree
Tabebuia argentea (Bur. & K.Schum) Britt*	+*				+		Tree
Tabebuia guayacan (Seem.)Hemsl.	+						Tree
Tabebuia palmeri Rose				+	+		Tree
Tabebuia rosea (Bertol) DC.	+				+		Tree
Tecoma stans (L.)Juss.ex HBK.*	+*	+*		+*	+*		Tree
Tecomaria capensis (Thunb.)Spach.*	+*			+*	+*		Shrub
Bixaceae							
Bixa orellana L.*					+*		Shrub
Bombacaceae							
Adansonia digitata L.*					+*		Tree
Bombax ceiba L.*	+*	+*	+*	+*	+*	+*	Tree
Ceiba pentandra (L.) Gaertn.*				+*	+		Tree
Chorisia crispiflora HBK*	+*			+*		+	Tree
Chorisia insignis Kunth.		+		+			Tree
Chorisia speciosa A.St.-Hil.*	+*		+*	+*	+*		Tree
Pachira sp.	+			+	+		Tree
Boraginaceae							
Cordia africana Lam.*				+*			Tree
Cordia dentata Poir.*				+*			Tree
Cordia holestii Girke*				+*			Tree

Appendix. Contd**.**

Cordia macleodii Hook.f. & Thoms.*				+*			Tree
Cordia myxa L.non Forssk.*	+*		+*	+*	+		Tree
Cordia sebestena L.*					+*		Shrub
Cordia sinensis Lam.			+		+		Tree
Ehretia ovalifolia Wight					+		Shrub
Ehretia wallichiana Hook.f.&Thoms.*				+*	+		Tree
Bromeliaceae							
Aechmea fasciata (Lindl.)Bak.					+		Indoor
Buxaceae							
Buxus sempervirens L.					+		Shrub
Cactaceae							
Astrophytum myriostigma Lem.					+		Cactus
Astrophytum ornatum (DC.)Britt. & Rose.*					+*		Cactus
Cephalocereus senilis (Haw.)Schum.*					+*		Cactus
Cereus jamacaru DC.*					+*		Cactus
Cereus uruguayanus Kiesling*				+*	+*		Cactus
Cereus uruguayanus Kiesling 'Monstrosus'					+		Cactus
Cleistocactus azarensis Card.					+		Cactus
Cleistocactus baumannii (Lem.)Lem.					+		Cactus
Cleistocactus strausii (Heese) Backeb.				+	+		Cactus
Cleistocactus winteri D.Hunt.				+	+		Cactus
Coryphantha elephantidens (Lem.)Lem.					+		Cactus
Coryphantha pycnacantha (Mart.) Lem.					+		Cactus
Coryphantha reduncispina Boedeker					+		Cactus
Coryphantha sp.					+		Cactus
Cryptocereus anthonyanus Alexand.					+		Cactus
Echinocactus grusonii Hildm.				+	+		Cactus
Echinocactus grusonii Hildm. 'Alba'					+		Cactus
Echinocactus platyacanthus Link & Otto.					+		Cactus
Echinopsis chamaecereus Friedrich & G.Rowley					+		Cactus
Echinopsis oxygana (Link) Zucc.					+		Cactus
Epiphyllum anguliger (Lem.) G.Don.					+		Cactus
Epiphyllum hybrida Hort.					+		Cactus
Espostoa lanata (Kunth) Britt. & Rose.					+		Cactus
Espostoa melanostele (Vaupel) Borg.					+		Cactus
Ferocactus glaucescens (DC.) Britt. & Rose *peninsulae* (F.A.Weber) Britt.& Rose					+		Cactus
Ferocactus haematacanthus (Salm-Dyck.) H.Bravo ex Backeb. & F. Kunth.					+		Cactus
Ferocactus histrix (DC.)G.Lindsay.					+		Cactus
Ferocactus latispinus (Haw.) Britt. & Rose					+		Cactus
Ferocactus peninsulae (F.A.Weber) Britt.& Rose					+		Cactus
Ferocactus pottsii (Salm-Dyck) Backeb.					+		Cactus
Ferocactus robustus (Otto ex Pfeiff.)Britt. & Rose					+		Cactus
Ferocactus wislizenii (Engelm.) Britt. & Rose					+		Cactus

Appendix. Contd.

Hylocereus triangularis (L.) Britt. & Rose					+		Cactus
Hylocereus undatus (Haw.) Britt. & Rose				+	+		Cactus
Mammillaria compressa DC.					+		Cactus
Mammillaria elongata DC.					+		Cactus
Mammillaria longimamma DC.					+		Cactus
Mammillaria prolifera (Mill.)Haw.					+		Cactus
Melocactus ernestii Vaupel.					+		Cactus
Myrtillocactus geometrizans (Mart.ex Pfeiff.) Console*					+*		Cactus
Opuntia basilaris Engelm. & Bigelow					+		Cactus
Opuntia brasiliensis (Willd.) Haw.					+		Cactus
Opuntia cylindrica (Lam.) DC.					+		Cactus
Opuntia cylindrica (Lam.) DC.'Cristata'					+		Cactus
Opuntia dejecta Salm-Dyck				+	+		Cactus
Opuntia falcata Ekman & Werderm.					+		Cactus
Opuntia ficus-indica (L.) Mill.*					+*		Cactus
Opuntia fulgida Engelm.					+		Cactus
Opuntia leucotricha DC.					+		Cactus
Opuntia lindheimeri Engelm.					+		Cactus
Opuntia macrocentra Engelm.					+		Cactus
Opuntia microdasys (Lehm.) Pfeiff. 'Albispina'					+		Cactus
Opuntia microdasys (Lehm.)Pfeiff. 'Pallida'					+		Cactus
Opuntia phaecantha Engelm.					+		Cactus
Opuntia pilifera F.A. Weber					+		Cactus
Opuntia rufida Engelm.					+		Cactus
Opuntia stricta Haw.					+		Cactus
Opuntia subulata (Muehlenpf.) Engelm					+		Cactus
Opuntia tomentosa Salm-Dyck					+		Cactus
Opuntia tunicata (Lehm.) Link & Otto					+		Cactus
Opuntia vulgaris Mill.*					+*		Cactus
Oreocereus celsianus (Cels ex Salm –Dyck) Riccob.					+		Cactus
Pachycereus marginatus (DC.) Britt & Rose					+		Cactus
Pachycereus pringlei (S.Wats) Britt. & Rose					+		Cactus
Pachycereus weberi (J.Coult.) Backeb.					+		Cactus
Pereskia aculeata Mill.					+		Cactus
Pilosocereus chrysacanthus (F.A.C.Weber) Byles & Rowley					+		Cactus
Stenocactus crispatus (DC.) A. Berger ex A.W. Hill					+		Cactus
Stenocactus multicostatus (Hildm. ex Schum.) A. Berger. ex A.W. Hill					+		Cactus
Stenocereus beneckei (Ehrenb.) F.Buxb.					+		Cactus
Stenocereus eruca (Brandg.) Gibson & Horak					+		Cactus
Stetsonia coryne (Salm-Dyck) Britt. & Rose					+		Cactus
Thelocactus setispinus (Engelm.) E.F.Anderson					+		Cactus
Trichocereus sp.					+		Cactus
Calycanthaceae							
Chimonanthus praecox (L.) Link.	+			+			Shrub

Appendix. Contd.

Cannaceae							
Canna indica L.*	+*	+*	+*	+*	+*	+*	Perennial herb
Canna x generalis L.H.Bail.*					+*		Perennial herb
Capparidaceae							
Crateva religiosa Forst.f.	+			+			Tree
Caprifoliaceae							
Abelia chinensis R.Br.	+			+	+		Shrub
Lonicera japonica Thunb.				+	+		Climber
Lonicera sempervirens L.*			+*		+		Climber
Sambucus nigra L.	+			+	+		Shrub
Viburnum tinus L.	+*			+*	+		Shrub
Caricaceae							
Carica papaya L.*	+*	+*			+*		Tree-like
Casuarinaceae							
Casuarina cunninghamiana Miq.*		+*	+*		+*	+*	Tree
Casuarina littoralis Salisb.*					+*		Tree
Casuarina verticillata Lam.*					+*		Tree
Celastraceae							
Euonymus japonica Thunb.*					+*		Tree
Cephalotaxaceae							
Cephalotaxus fortunei Hook.*					+*		Conifer
Combretaceae							
Anogeissus latifolia (DC.)Wallich ex Guillemin & Perrottet				+	+		Tree
Conocarpus erectus L.					+		Tree
Poivrea densiflora L.*	+*						Climber
Quisqualis indica L.*	+*				+		Climber
Terminalia angustifolia Bedd.*					+*		Tree
Terminalia arjuna (Roxb.) Wight&Arn.*	+*		+*	+*	+*		Tree
Terminalia bellirica (Gaertn.) Roxb.*	+*			+*	+	+*	Tree
Terminalia catappa L.*					+*		Tree
Terminalia chebula (Gaertn.) Retz.*				+*			Tree
Terminalia laxiflora Engl.& Diels	+*			+*	+*		Tree
Terminalia muelleri Benth.				+*			Tree
Terminalia myriocapa Heurck & J.Muell.	+*			+*			Tree
Commelinaceae							
Tradescantia pallida (Rose) D.Hunt.'Purpurea'*	+*	+*	+*	+*	+*	+	Perennial herb
Tradescantia spathacea Sw.					+		Perennial herb
Compositae							
Argyranthemum frutescens (L.) Schultz-Bip.				+	+		Perennial herb
Centaurea cineraria L.*			+*	+*	+*		Perennial herb
Dendranthema indicum (L.)Des Moul.*	+*	+*	+*	+*	+*	+*	Perennial herb
Euryops pectinatus (L.) Cass.					+		Perennial herb
Euryops virgineus (L.f.) DC.					+		Perennial herb
Farfugium japonicum (L.) Kitam.*					+*		Perennial herb
Felicia amelloides (L.) Voss.					+		Perennial herb

Appendix. Contd.

Gerbera jamesonii Bol. ex Adlam.	+				+		Perennial herb
Kleinia fulgens Hook.f.					+		Succulent
Kleinia stapeliiformis (E.Phillips) Stapf.					+		Succulent
Montanoa bipinnatifida (Kunth.) K.Koch.				+	+		Shrub
Senecio cineraria DC.*					+*		Perennial herb
Senecio petasitis (Sims) DC.*	+*				+*		Perennial herb
Wedelia trilobata (L.) Hitch.					+		Perennial herb
Convolvulaceae							
Argyreia nervosa (Burm.f.) Bojer.	+			+	+		Climber
Ipomoea cairica (L.) Sweet.					+		Climber
Ipomoea fistulosa Mart. ex Choisy	+			+			Climber
Ipomoea mauritiana Jacq.				+			Shrub
Ipomoea tricolor Cav.			+				Climber
Jacquemontia pentantha (Jacq.)D.Don					+		Climber
Porana paniculata Roxb.*	+*						Climber
Crassulaceae							
Adromischus cooperi (Bak.)A.Berger.					+		Succulent
Aeonium arboreum (L.)Webb. &Berth.					+		Succulent
Aeonium arboreum (L.)Webb.&Berth.'Atropurpurum'					+		Succulent
Cotyledon ladysmithiensis Poelln.					+		Succulent
Cotyledon orbiculata L					+		Succulent
Cotyledon tomentosa Harv.					+		Succulent
Crassula arborescens (Mill.) Willd.					+		Succulent
Crassula ovata (Mill.) Druce					+		Succulent
Crassula ovata (Mill.) Druce 'Sunset'					+		Succulent
Echeveria elegans Rose					+		Succulent
Kalanchoa beharensis Drake					+		Succulent
Kalanchoa blossfeldiana Poelln.					+		Succulent
Kalanchoa daigremontiana Hamet & Perrier					+		Succulent
Kalanchoa fedtschenkoi Hamet & Perrier					+		Succulent
Kalanchoa longiflora Schlechtend					+		Succulent
Kalanchoa marmorata Bak.					+		Succulent
Kalanchoa pinnata (Lam.) Pers.					+		Succulent
Kalanchoa sp.					+		Succulent
Kalanchoa tomentosa Bak.					+		Succulent
Kalanchoa tubiflora (Harv.) Hamet				+	+		Succulent
Kalanchoa velutina Welv.					+		Succulent
Cucurbitaceae							
Luffa cylindrica (L.) M.Roem.*					+*		Climber
Cupressaceae							
Chamaecyparis lawsoniana (Murray)Parl.*	+*				+*		Conifer
Cupressus arizonica Green.*	+*				+*		Conifer
Cupressus lusitanica Mill.*					+*		Conifer
Cupressus macrocarpa Hartw. ex Gordon.*	+*	+*			+*		Conifer
Cupressus *sempervirens* L.*	+*	+*			+*		Conifer

Appendix. Contd.

Cupressus sempervirens L. 'Pyramidales'					+		Conifer
Cupressus sempervirens L. 'Stricta'					+		Conifer
Juniperus sp.					+		Conifer
Platycladus orientalis (L.f.) Franco*	+*	+*	+*		+*	+*	Conifer
Tetraclinis articulata (Vahl) M.T.Mast*					+*		Conifer
Cycadaceae							
Cycas beddomei Dyer.					+		Cycads
Cycas circinalis L.*	+*			+*	+*		Cycads
Cycas revoluta Thunb.*	+*				+*	+	Cycads
Cyperaceae							
Cyperus alternifolius L.*	+*			+*	+*		Water plant
Cyperus papyrus L.*				+*	+*		Water plant
Davalliacea							
Nephrolepis exaltata (L.)Schott.	+				+		Fern
Dilleniaceae							
Dillenia indica L.*				+*	+		Tree
Ebenaceae							
Diospyros ebenum J. König ex Retz.*	+*						Tree
Diospyros kaki L.f.*					+*		Tree
Diospyros lotus L.*				+*	+*		Tree
Euclea pseudebenum E.Meyer	+				+		Tree
Elaeagnaceae							
Elaeagnus macrophylla Thunb.*					+*		Shrub
Euphorbiaceae							
Acalypha wielkesiana Muell. Arg.	+	+	+		+		Shrub
Acalypha wielkesiana Muell. Arg. 'Hoffmananna'					+		Shrub
Acalypha wielkesiana Muell. Arg.'Macrophylla'	+	+		+	+		Shrub
Aleurites moluccana (L.) Willd.*				+*	+		Tree
Antidesma bunius (L.) Spreng.*				+*	+		Tree
Bischofia javanica Blume				+			Shrub
Breynia nivosa (W.G.Sm.) Small.	+			+	+		Shrub
Codiaeum variegatum (L.) Bl.	+	+			+		Shrub
Euphorbia abyssinica J.F.Gmel.*				+*	+*		Succulent
Euphorbia canariensis L.*					+*		Succulent
Euphorbia caput-medusae L.'Minor'					+		Succulent
Euphorbia coerulescens Haw.*					+*		Succulent
Euphorbia cooperi N.E.Br.					+		Succulent
Euphorbia grandicornis Goebel.					+		Succulent
Euphorbia horrida Boiss.					+		Succulent
Euphorbia ingens E.Mey.				+	+		Succulent
Euphorbia lactea Haw.			+	+	+		Succulent
Euphorbia lactea Haw. 'Cristata'					+		Succulent
Euphorbia lactea Haw. 'Monstrosa'		+		+	+		Succulent
Euphorbia mammillaris L.					+		Succulent
Euphorbia mauritanica L.					+		Succulent

Appendix. Contd.

Euphorbia milii Des Moul.*					+*		Succulent
Euphorbia neglecta N.E.Br.					+		Succulent
Euphorbia neriifolia L.					+		Succulent
Euphorbia nubica N.E.Br.					+		Succulent
Euphorbia obesa Hook.f.			+	+	+		Succulent
Euphorbia pseudocactus A.Berger.					+		Succulent
Euphorbia pulcherrima Willd. ex Klotzsch.					+		Succulent
Euphorbia royleana Boiss.			+		+		Succulent
Euphorbia stenoclada Baill. ssp. *stenoclada*					+		Succulent
Euphorbia trigona Mill.					+		Succulent
Euphorbia x *zigzag*				+			Succulent
Jatropha curcas L.*					+*		Shrub
Jatropha integerrima Jacq.					+		Shrub
Jatropha multifida L.*					+*		Shrub
Joannesia princips Vell.*	+*			+*	+*		Tree
Pedilanthus tithymaloides (L.) Poit					+		Succulent
Pedilanthus tithymaloides (L.) Poit 'Variegata'					+		Succulent
Phyllanthus angustifolius (Sw.)Sw.					+		Shrub
Phyllanthus emblica L.*				+*			Tree
Putranjiva roxburghii Wallich.*				+*	+*		Tree
Sapium sebiferum (L.)Roxb.*				+*			Tree
Synadenium compactum var.rubrum S.Carter					+		Succulent
Synadenium grantii Hook.f.		+	+	+	+		Succulent
Synadenium grantii Hook.f. 'Rubra'					+		Succulent
Fagaceae							
Quercus ilex L.*					+*		Tree
Quercus incana Bartram*					+*		Tree
Quercus robur L.*	+*			+*	+*		Tree
Quercus suber L.*					+*		Tree
Flacourtiaceae							
Dovyalis caffra Warb.*				+*	+*		Tree
Flacourtia indica (Burm.f.)Merr.*	+*						Tree
Flacourtia jangomans (Lour.) Räuschel*				+*	+*		Tree
Flacourtia rukam Zoll. & Moritzi*.					+*		Tree
Muntingia calabura L.*				+*			Shrub
Oncoba spinosa Forssk.*					+*		Shrub
Geraniaceae							
Pelargonium zonale (L.) L'Hér.*	+*	+*	+*	+*	+*	+*	Perennial herb
Ginkgoaceae							
Ginkgo biloba L.*					+*		Conifer
Gramineae							
Bambusa multiplex Lour. Rausch.*					+*		Tree-like
Bambusa vulgaris Schräder.ex Wendl.*		+*			+*		Tree-like
Cortaderia selloana (Schult. & Schult.f.)Asch. & Gräbn.*	+*				+		Perennial herb
Dendrocalamus giganteus Munro.*				+*	+*		Tree-like

Appendix. Contd.

Dendrocalamus strictus (Roxb.) Nees.*					+*		Tree-like
Pennisetum setaceum (Forssk.)Chiov.					+*		Perennial herb
Phyllostachys aurea (Carr.)A. & C. Riv.*					+*		Tree-like
Phyllostachys bambusoides Sieb. & Zucc.*					+*		Tree like
Guttiferae							
Clusia rosea Jacq.*	+*						Shrub
Garcinia dulcis (Roxb.)Kurz.*					+*		Shrub
Hamamelidaceae							
Liquidambar styraciflua L.*	+*						Tree
Hydrangeaceae							
Philadelphus x virginalis Rehd.					+		Shrub
Iridaceae							
Iris pseudacorus L.					+		Water plant
Juglandaceae							
Carya illinoensis K.Koch.*					+*		Tree
Labiatae							
Origanum majorana L.*					+*		Perennial herb
Rosmarinus officinalis L.*	+*				+*		Perennial herb
Salvia coccinea Juss. ex J. Murr.*					+*		Perennial herb
Salvia farinacea Benth.	+	+	+	+	+	+	Perennial herb
Salvia splendens Sellow ex Roem. & Schult.*					+*		Perennial herb
Solenostemon scutellarioides (L.) Codd					+		Perennial herb
Lauraceae							
Cinnamomum camphora (L.)Sieb.*	+*			+*	+		Tree
Cinnamomum glanduliferum (Wallich) Meissn.*					+*		Tree
Cinnamomum zeylanicum Blume*	+*			+*	+		Tree
Laurus nobilis L.*	+*				+		Tree
Persea americana Mill.*	+*				+		Tree
Leeaceae							
Leea guineensis G. Don.	+				+		Shrub
Leguminosae							
Acacia farnesiana (L.) Willd.*				+*			Tree
Acacia glaucophylla Steud.*				+*	+*		Tree
Acacia nilotica (L.)Willd. ex Delile*	+*			+*	+		Tree
Acacia nilotica (L.)Willd. ex Delile ssp.*tomentosa*					+		Tree
Acacia saligna (Labill.) H.Wendl.*	+*		+	+			Tree
Acacia seyal Delile*				+*			Tree
Acrocarpus fraxinifolius Arn.*	+*			+*			Tree
Adenanthera pavonina L.*	+*			+*			Tree
Aeschynomene elaphroxylon (Guill. et Perr.) Taub*					+*		Water plant
Albizia anthelminthica A. Brogn*.	+*			+*			Tree
Albizia julibrissin Durazz.*				+*	+*		Tree
Albizia lebbek (L.) Benth				+*	+*		Tree
Albizia lophantha Benth.				+*			Tree
Albizia lucida (Roxb.)Benth.*					+*		Tree

Appendix. Contd.

Albizia procera (Roxb.) Benth.*				+*	+*		Tree
Albizia stipulata (Roxb.) L. H. Boivin.*				+*			Tree
Alexa imperatricis R.H.Schemburgk Baker *				+*			Tree
Amorpha fruticosa L.				+			Shrub
Bauhinia candida Ait.*	+*	+*		+*	+*		Tree
Bauhinia hookeri Hort.					+		Tree
Bauhinia racemosa Lam.*					+*		Tree
Bauhinia retusa Roxb.					+		Tree
Bauhinia variegata L.*			+*	+*	+8		Tree
Brownea ariza Benth.	+						Shrub
Butea monosperma (Lam.) Taub.*	+*			+*			Shrub
Caesalpinia ferrea Mart. ex Tul.*	+*			+*	+		Tree
Caesalpinia gilliesii (Wallich ex Hook.) Benth.*	+*				+		Shrub
Caesalpinia pulcherrima (L.)Sw.*					+*		Shrub
Calliandra haematocephala Hassk.				+	+		Shrub
Cassia fistula L.*	+*			+*	+*	+	Tree
Cassia grandis L.f.	+				+		Tree
Cassia nodosa Roxb.	+		+	+	+		Tree
Cassia roxburghii DC.	+			+	+	+	Tree
Ceratonia siliqua L.*	+*						Tree
Cercis chinensis Bunge	+			+	+		Shrub
Colvillea racemosa Bojer ex Hook.					+		Tree
Crotalaria madurensis Wight				+	+		Shrub
Dalbergia paniculata Roxb.*	+*			+*	+		Tree
Dalbergia sissoo Roxb ex DC.*				+*	+*		Tree
Delonix regia (Bojer) Raf.*	+*		+*	+*			Tree
Derris elliptica (Wallich) Benth.	+	+	+		+	+	Climber
Dischrostachys cinerea (L.) Wight & Arn.*				+*	+*		Shrub
Enterolobium contortisiliqum (Vell.)Morong.*	+*			+*	+	+*	Tree
Enterolobium cyclocarpa (Jacq.) Griseb.*	+*		+*		+		Tree
Erythrina caffra Thunb.*					+*		Tree
Erythrina corallodendrum L.*	+*	+*	+*		+*		Tree
Erythrina crista-galli L.*		+*		+*	+		Tree
Erythrina crista-japonica					+		Tree
Erythrina poeppigiana (Walp.) Cook.*				+*	+*		Tree
Erythrina speciosa Andr.					+		Tree
Erythrina spinosa Voigt					+		Tree
Erythrina variegata L.					+		Tree
Genista monosperma (L.)Lam.*	+*			+*	+		Tree
Gleditsia aquatica Marsh.*					+*		Tree
Gleditsia caspica Desf.*	+*				+*		Shrub
Gleditsia triacanthos L.*	+*			+*	+*		Tree
Haematoxylum campechianum L.*			+*	+*	+*		Tree
Leucaena leucocephala (Lam.) De Wit.	+		+		+	+	Tree
*Lonchocarpus sp*eciosus Boulos*	+*	+*	+*	+*	+*		Tree

Appendix. Contd.

Parkia biglobosa (Jacq.) Benth.*	+*			+*	+*		Tree
Parkia roxburghii G. Don*	+*						Tree
Parkinsonia aculeata L.*	+*						Tree
Peltophorum africanum Sonder	+				+	+	Tree
Pithecellobium dulce (Roxb.) Benth.				+			Tree
Pithecellobium lobatum Benth.	+						Tree
Pongamia pinnata (L.) Merr.*	+		+*	+	+	+	Tree
Prosopis juliliflora (Sw.) DC.*				+*	+*		Tree
Pterocarpus dalbergoides Roxb.*					+*		Tree
Pterocarpus indicus Willd.					+		Tree
Robinia pseudoacacia L.*				+*	+*		Tree
Saraca cauliflora Bak.*					+*		Tree
Saraca indica L.*	+*				+*		Tree
Schotia brachypetala Sonder					+		Tree
Senna alata (L.) Roxb.					+		Shrub
Senna artemisioides (DC.) Randell.*					+*		Shrub
Senna bicapsularis (L.) Roxb.					+		Shrub
Senna didymobotrya (Fres.) Irwin & Barneby	+		+	+	+		Shrub
Senna occidentalis (L.) Link.*	+*				+*		Shrub
Senna siamea (Lam.) Irwin & Barneby*				+*	+		Shrub
Senna spectabilis (DC.) Irwin & Barneby*	+						Shrub
Senna surratensis (Burm f.) Irwin & Barneby*	+*				+		Shrub
Sophora japonica L.*				+	+		Tree
Sophora secundiflora (Ort.) Lag.ex DC.*	+*				+		Tree
Tamarindus indica L.*				+*	+		Tree
Tipuana tipu (Benth.)G. Kuntze*		+*	+*	+*	+*		Tree
Wisteria sinensis (Sims.) Sweet*	+*	+*		+*	+*		Climber
Liliaceae							
Asparagus densiflorus (Kunth) Jessop.*	+*		+*	+*	+*	+*	Perennial herb
Asparagus falcatus L.*	+*						Climber
Asparagus setaceus (Kunth) Jessop.*				+*	+*		Climber
Aspidistra lurida Ker-Gawl.*	+*				+*		Perennial herb
Chlorophytum comosum (Thunb.) Jacques	+		+		+		Perennial herb
Hemerocallis fulva L.					+		Bulbs
Ruscus aculeatus L.*		+*		+*	+*		Perennial herb
Loganiaceae							
Buddleja asiatica Lour.					+		Shrub
Buddleja x *hybrida* Farq.					+		Shrub
Buddleja madagascariensis Lam.*	+*						Shrub
Strychnos nux-vomica L.				+			Tree
Strychnos spinosa Lam.				+			Shrub
Lythraceae							
Heimia myrtifolia Cham. & Schlechtend	+				+		Shrub
Lagerstroemia indica L.*	+*	+*	+*	+*	+*	+*	Shrub
Lagerstroemia speciosa (L.) Pers.*	+*						Tree

Appendix. Contd.

Lagerstroemia tomentosa K.Persl*	+*						Tree
Woodfordia fruticosa (L.)Kurz.*				+*			Shrub
Magnoliaceae							
Magnolia grandiflora L.*	+*			+	+		Tree
Malpighiaceae							
Byrsonima crassifolia (L.) HBK.*	+*						Tree
Hiptage madablota Gaertn.	+			+	+		Climber
Malpighia glabra L.					+		Tree
Malvaceae							
Abutilon hirtum (Lam.) Sweet.	+				+		Shrub
Anisodontea capensis (L.) Bates.					+		Perennial herb
Hibiscus rosa-sinensis L.*	+*	+*	+*	+*	+*	+*	Shrub
Hibiscus rosa-sinensis L. 'Cooperi'					+		Shrub
Hibiscus rosa-sinensis L. 'Red'					+		Shrub
Hibiscus syriacus L.			+		+		Shrub
Hibiscus syriacus L. 'Blue'					+		Shrub
Hibiscus tiliaceus L.					+		Shrub
Lagunaria patersonii (Andrews) G. Don. f.				+	+		Tree
Malvaviscus arboreus Cav.	+		+		+	+	Shrub
Thespesia populnea (L.) Sol. ex Corr.					+*		Tree
Marantaceae							
Calathea makoyana (E.Morr.) E.Morr.	+				+		indoor
Thalia dealbata J. Fraser.*					+*		Water plant
Meliaceae							
Aphanamixis polystachya (Wallich) Parker.*	+*			+*	+*		Tree
Azadirachta indica A. Juss				+	+		Tree
Cedrela odorata L.*				+*	+*		Tree
Cedrela toona Roxb.ex Rottl..*				+*	+*		Tree
Khaya daweii.*				+*			Tree
Khaya senegalensis (Desr.) A.Juss.*	+*	+*		+*	+		Tree
Melia azedarach L..*	+*			+	+*		Tree
Swietenia macrophylla King.*				+*	+		Tree
Swietenia mahogany (L.) Jacq.*				+*	+	+*	Tree
Moraceae							
Artocarpus altilis (Parkinson) Fosb.*	+*				+*		Tree
Artocarpus heterophyllus Lam.*	+*				+*		Tree
Ficus afzelii G.Don ex Loud.*				+*	+*	+*	Tree
Ficus aspera Forst.f.*					+*		Tree
Ficus auriculata Lour.*					+*		Tree
Ficus benghalensis L.*	+*		+*	+*	+*	+*	Tree
Ficus benjamina L.*	+*	+*	+*	+*	+*	+*	Tree
Ficus bennendykii (Miq.) Miq.	+	+	+	+	+	+	Tree
Ficus bennendykii (Miq.) Miq. 'Variegata'					+		Tree
Ficus carica L.*	+*				+*		Tree
Ficus cunninghamii Miq.*			+*	+*	+*		Tree

Appendix. Contd.

Ficus cyathistipula Warb.			+		+		Tree
Ficus deltoidea Jack.	+				+		Tree
Ficus elastica Roxb.ex Hornem.*	+*			+*			Tree
Ficus elastica Roxb.ex Hornem. 'Decora'	+	+	+	+	+	+	Tree
Ficus elastica Roxb.ex Hornem.'variegata'					+		Tree
Ficus exasperata Vahl.	+	+	+		+		Tree
Ficus gibbosa Blume*					+*		Tree
Ficus hispida L.f.*					+*		Tree
Ficus laurifolia Lam.*				+*			Tree
Ficus lyrata Warb.*	+*	+*		+*	+*		Tree
Ficus macrophylla Desf. ex Pers.*				+*	+*		Tree
Ficus microcarpa L.f.'Hawai'	+	+	+		+	+	Tree
Ficus mysorensis Heyne ex Roth.*	+*		+*	+*	+*		Tree
Ficus nitida Thunb.	+	+	+	+	+	+	Tree
Ficus platipoda Miq.*			+*	+*	+*	+*	Tree
Ficus platyphylla Del.*			+*	+*	+*		Tree
Ficus pseudosycomorus Decne*					+*		Tree
Ficus pyriformis L.*	+*			+*	+*		Tree
Ficus racemosa L.*		+*	+*	+*	+*	+*	Tree
Ficus religiosa L.*		+*	+*	+*	+*		Tree
Ficus rubiginosa Desf. ex Vent.*		+*					Tree
Ficus spreguana Mildr.*					+*		Tree
Ficus sycomorus L.*			+*	+*	+*		Tree
Ficus trijuja L.*					+*		Tree
Ficus vasta Forssk.*	+*						Tree
Ficus virens Ait.*			+*		+*		Tree
Maclura pomifera (Raf.) Schneid.*		+*		+*	+*	+*	Tree
Morus alba L.*		+*		+	+*		Tree
Morus macroura Miq. 'Omani'					+		Tree
Morus nigra L.*	+*		+*		+*		Tree
Moringaceae							
Moringa aptera (Forssk.)Fiori*					+*		Tree
Moringa oleifera Lam.*					+*		Tree
Myoporaceae							
Bontia daphnoides L.					+		Shrub
Eremophila maculata F.Muell.					+		Perennial herb
Myoporum laetum Forst. f.*			+*				Tree
Myrsinaceae							
Ardisia crenata Sims.*					+*		Shrub
Myrtaceae							
Callistemon citrinus (Curtis) Skeels*	+*			+*	+*		Tree
Callistemon linearis (Schrad. & J.C.Wendl.) DC.*					+*		Tree
Callistemon rigidus R.Br.*					+*		Tree
Callistemon subulata					+		Shrub
Eucalyptus camaldulensis Dehnh.*			+*	+*	+*	+*	Tree

Appendix. Contd.

Eucalyptus citriodora Hook.*	+*			+*			Tree
Eucalyptus gomphocephala DC.*				+*		+*	Tree
Eugenia supra-axillaris Spring.*	+*			+*			Tree
Eugenia uniflora L.*	+*			+	+		Tree
Feijoa sellowiana O.Berg.*	+*				+		Shrub
Melaleuca ericifolia Sm.*		+*		+*	+*	+*	Tree
Melaleuca leucadendron (L.) L.*				+*			Tree
Myrciaria edulis (Vell.) Skeels*			+*	+*	+		Tree
Myrtus communis L.*	+*				+		Shrub
Pimenta dioica (L.) Merr.*	+*				+		Tree
Pimenta racemosa (Mill.) J.W.Moore*	+*				+*		Tree
Psidium guajava L.	+			+	+	+	Tree
Syzygium aqueum (Burm.f.) Alston.*	+*						Tree
Syzygium cuminii (L.)Skeels *	+*			+*	+	+*	Tree
Syzygium jambos (L.) Alston*					+*		Tree
Syzygium samarangense Blume Merrill & L.M.Perry*	+*			+*			Tree
Nelumbonaceae							
Nelumbo nucifera Gaertn.*		+*			+*		Water plant
Nyctaginaceae							
Bougainvillea x *buttiana* Holtt & Standl.'Mss.Butt'					+		Climber
Bougainvillea glabra Choisy*	+*	+*			+*		Climber
Bougainvillea glabra Choisy 'Variegata'					+		Climber
Bougainvillea spectabilis Willd.*		+*	+*		+*		Climber
Nymphaeaceae							
Nymphaea caerulea Savigny*					+*		Water plant
Ochnaceae							
Ochna serrulata (Hochst.) Walp.	+						Shrub
Oleaceae							
Fraxinus angustifolia Vahl*				+*	+*		Shrub
Fraxinus velutina Torr.*				+*			Shrub
Jasminum azoricum L.*			+*		+*		Climber
Jasminum dichotomum Vahl					+		Climber
Jasminum grandiflorum L.*	+*				+*		Climber
Jasminum mesnyi Hance	+				+		Climber
Jasminum multiflorum (Burm.f.) Andr.	+				+		Climber
Jasminum sambac (L.)Ait.*	+*						Climber
Ligustrum lucidum Ait.f.*	+*			+			Tree
Ligustrum ovalifolium Hassk.*	+*			+*	+		Shrub
Olea europaea L.*	+*						Shrub
Syringa amurensis Rupr.*	+*						Shrub
Oxalidaceae							
Averrhoa carambola L.					+		Shrub
Palmae							
Acrocomia aculeata (Jacq.)Lodd.ex.Mart.*					+*		Palm

Appendix. Contd.

Archontophoenix alexandrae (F.J.Muell.)H.A.Wendl. & Drude*	+*				+		Palm
Archontophoenix cunninghamiana (H.A.Wendl.)& Drude*				+*	+*		Palm
Arenga engleri Becc.*	+*				+*		Palm
Attalea sp.					+		Palm
Bismarckia nobilis Hildebr. & H. Wendl.					+		Palm
Borassus flabellifer L.*					+*		Palm
Brahea armata S.Wats.*	+*			+*	+*		Palm
Butia capitata (Mart.) Becc.*					+*		Palm
Calamus rotang L.	+				+		Palm
Carpentaria acuminata (H.Windl. &Drude) Becc.					+		Palm
Caryota mitis Lour.*	+*	+*		+*	+*		Palm
Caryota urens L.*		+*		+*	+*		Palm
Chamaedorea elegans Mart.*	+*				+*		Palm
Chamaedorea microspadix Burret.					+		Palm
Chamaedorea seifrizii Burret.	+				+		Palm
Chamaerops humilis L.*	+*	+*			+*		Palm
Copernicia prunifera (Mill.)H.E.Moore					+		Palm
Dypsis decari					+		Palm
Dypsis lutescens H.Wendl.H.Beentje & J.Dransfield*					+*		Palm
Elaeis guineensis Jacq.					+		Palm
Howea belmoreana (C. Moore & F. Muell.) Becc.	+				+		Palm
Howea fosteriana (C. Moore & F. Muell.) Becc.	+				+		Palm
Hyophorbe lagenicaulis (L.H.Bail.) H.E.Moore*					+*		Palm
Hyophorbe verschaffeltii H.A.Wendl.*	+*				+*		Palm
Hyphaena thebaica (L.) Mart.*	+*		+*	+*	+*		Palm
Latania lantaroides (Gaertn.)H.E.Moore*					+*		Palm
Licuala grandis H.A.Wendl.					+		Palm
Livistona australis (R.Br.) Mart.*	+*			+*	+*		Palm
Livistona chinensis (Jacq.)R.Br.ex Mart.*	+*	+*	+*	+*	+*		Palm
Livistona decipiens Becc.*	+*				+*		Palm
Livistona robinsoniana Becc.*					+*		Palm
Livistona rotundifolia (Lam.)Mart.*	+*				+*		Palm
Normanbya normanbyi (W.Hill) L.H.Bail.					+		Palm
Phoenix canariensis Hort.ex Chabaud.*	+*	+*	+*	+*	+*		Palm
Phoenix dactylifera L.*	+*	+*	+*	+*	+*	+*	Palm
Phoenix reclinata Jacq.*			+*		+*		Palm
Phoenix roebelinii O'Brien*			+*				Palm
Phoenix rupicola Anderson*					+*		Palm
Ptycosperma elegans (R.Br.)Bl.*	+*				+		Palm
Ravena rivularis Jum. & H. Perrier					+		Palm
Rhapis excelsa (Thunb.) A.Henry*	+*		+	+	+		Palm
Roystonea oleracea (Jacq.) Cook.*	+*	+*	+*	+*	+*	+*	Palm
Roystonea regia (HBK) O.F.Cook*	+*				+*		Palm
Sabal blackburniana Glazeber.ex Schult. & Schult.f.*	+*	+*			+*		Palm

Appendix. Contd.

Sabal causiarum (Cook) Becc.*					+*		Palm
Sabal minor (Jacq.)Pers.		+			+		Palm
Sabal palmetto (Walt.) Schult. &Schult.f.*	+*		+		+*		Palm
Sabal yapa Wright ex Becc.*	+*	+*	+*	+*	+*	+*	Palm
Syagrus romanzoffianum (Cham.) Glassman*	+*	+*	+*	+*	+*	+*	Palm
Thrinax parviflora Swartz.*	+*						Palm
Trachycarpus fortunei (Hook.)H.Wendl.*	+*				+*		Palm
Trithrinax acanthocoma Drude					+		Palm
Washingtonia filifera (Linden) H.Wendl.*	+*	+*	+*	+*	+*	+*	Palm
Washingtonia robusta H.Wendl.*	+*	+*	+*	+*	+*	+*	Palm
Wodyetia bifurcata A.K.Irvine					+		Palm
Pandanaceae							
Pandanus utilis Bory					+		Tree
Passifloraceae							
Passiflora caerulea L*					+*		Climber
Passiflora edulis Sims.*					+*		Climber
Phytolaccaceae							
Phytolacca dioica (L.) Moq.*	+*				+		Tree
Rivina humilis L.*					+*		Perennial herb
Pinaceae							
Pinus brutia Medv.					+		Conifer
Pinus brutia Ten.ssp. *eldarica* (Medv.) Nahal.					+		Conifer
Pinus canariensis Sweet ex Spreng*	+*				+*		Conifer
Pinus halepensis Mill.*	+*	+	+		+		Conifer
Pinus pinea L.*		+*	+*		+*		Conifer
Pinus roxburghii Sarg.*	+*	+*	+*		+*	+*	Conifer
Piperaceae							
Peperomia obtusifolia (L.) Dietr.					+		Succulent
Piper nigrum L.					+		Climber
Pittosporaceae							
Hymenosporum flavum (Hook.)F.Muell.					+		Tree
Pittosporum tobira Ait.*	+*			+*	+		Shrub
Pittosporum tobira Ait. ÁVariegata'	+*			+*			Shrub
Platanaceae							
Platanus orientalis L.*				+*	+*		Tree
Plumbaginaceae							
Plumbago auriculata Lam.*	+*			+*	+*		Perennial herb
Podocarpaceae							
Afrocarpus gracilior (Pilg.) C.N.*	+*				+*		Conifer
Podocarpus macrophyllus (Thunb.) Sweet*	+*						Conifer
Podocarpus elongatus (Ait) L'Her. ex Pers.*	+*				+*		Conifer
Polygalaceae							
Polygala myrtifolia L.*					+*		Shrub
Polygala x *dalmaisiana* Hort.					+		Shrub
Polygonaceae							

Appendix. Contd.

Antigonon leptopus Hook. & Arn.	+				+		Climber
Coccoloba peltata Schott.*					+*		Tree
Coccoloba uvifera (L.) L.					+		Tree
Ruprechtia polystachya L.*	+*				+*		Tree
Ruprechtia salicifolia (Cham. & Schlecht) C.A. Mey*					+*		Tree
Polypodiaceae							
Polypodium vulgare L.	+						Fern
Portulacaceae							
Portulacaria afra Jacq.*				+*	+*		Succulent
Portulacaria afra Jacq. 'Variegata'					+		Succulent
Proteaceae							
Grevillea hilliana F.Muell.*					+*		Tree
Grevillea robusta A.M.Cunn. ex R.Br.*	+*		+*		+*	+*	Tree
Macademia integrifolia Maiden & Betche*				+*	+*		Tree
Punicaceae							
Punica granatum L.*		+*			+*		Shrub
Punica granatum L.'Nana'					+		Shrub
Ranunculaceae							
Clematis flammula L.	+						Climber
Rhamnaceae							
Hovenia dulcis Thunb.*					+*		Tree
Rhamnus alternus L.					+		Tree
Rhamnus cathartica L.*				+*	+		Tree
Ziziphus jujuba Mill.	+	+	+	+	+		Tree
Ziziphus spina-christi (L.) Willd.*	+*		+*		+*		Tree
Rosaceae							
Cotoneaster horizontalis Decne					+		Shrub
Cydonia oblonga Mill.*	+*				+*		Shrub
Eriobotrya japonica (Thunb.) Lindl.*	+*			+*	+		Tree
Prunus armeniaca L.			+	+	+	+	Tree
Prunus persica (L.) Batsch.			+		+		Tree
Pyracantha crenatoserrata (Hance) Rehd.	+				+		Shrub
Pyrus calleryana Decne*	+*			+*	+*		Tree
Rhaphiolepis umbellata (Thunb.) Mak.	+				+		Shrub
Rosa banksiae Ait.	+*			+*	+*		Shrub
Rosa multiflora Thunb.ex J.Murr.					+		Shrub
Spiraea x *vanhouttei* (C.Briott.) Zab.	+				+		Shrub
Rubiaceae							
Coffea arabica L.*	+*			+*	+		Shrub
Gardenia sp.				+	+		Tree
Gardenia thunbergia L.f.*					+*		Tree
Hamelia patens Jacq.*	+*				+		Shrub
Ixora coccinea L.					+		Shrub
Ixora undulata Roxb.*	+*				+*		Shrub
Morinda tinctoria Roxb.*				+*			Tree

Appendix. Contd.

Mussaenda luteola Delile*	+*						Shrub
Nauclea orientalis (L.) L.*				+*			Tree
Pentas lanceolata (Forssk.) Deflers*	+*				+		Perennial herb
Rondeletia odorata Jacq.*	+*						Shrub
Vangueria edulis Vahl*	+*						Shrub
Vangueria tomentosa Hochst.*	+*						Shrub
Rutaceae							
Aegle marmelos (L.) Correa*	+*			+*	+		Tree
Casimiroa edulis Llave*	+*	+*		+*	+*		Tree
Citrus aurantifolia (Christm.)Swingle*			+*		+*	+*	Tree
Citrus aurantium L.*			+*		+*		Tree
Citrus limon (L.) Burm.f.*						+*	Tree
Feronia limonia (L.)Swingle*				+*			Tree
Fortunella margarita (Lour.) Swingle					+		Shrub
Glycosmis pentaphylla (Retz.)Corr.Serr.				+	+		Shrub
Murraya paniculata (L.) Jacq.*	+*			+	+		Shrub
Ruta graveolens L.*				+*	+*		Perennial herb
Severenia buxifolia (Poir.)Ten.*					+*		Shrub
Salicaceae							
Populus nigra L.	+						Tree
Salix babylonica L.*					+*		Tree
Salix mucronata Thunb.		+			+		Tree
Salix tetrasperma Roxb.					+		Tree
Salvadoracea							
Salvadora persica L.					+		Shrub
Sapindaceae							
Alectryon tomentosum F.Muell. &Radlk.*				+*	+*	+*	Tree
Cardiospermum halicacabum L.					+		Climber
Dimocarpus longan Lour.*	+*				+*		Tree
Dodonaea viscosa (L.) Jacq.	+	+	+	+	+	+	Shrub
Harpullia arborea (Blanco) Radlk.	+			+			Tree
Harpullia pendula Planch.ex F.Muell.	+			+	+		Tree
Koelreuteria elegans (Seem.)A.C.Sm.	+			+	+		Tree
Koelreuteria paniculata Laxm.				+	+		Tree
Sapindus saponaria L.*		+*		+*	+*		Tree
Sapotaceae							
Chrysophyllum cainito L.*				+*	+		Tree
Chrysophyllum oliviforme Roxb.*				+*	+*		Tree
Madhuca latifolia Roxb.*	+*			+*	+		Tree
Madhuca longifolia (Koenig) Macbr.*				+*	+*		Tree
Manilkara hexandra (Roxb.) Dubard*				+*	+		Tree
Manilkara zapota (L.)Royen.*	+*			+*	+		Tree
Mimusops caffra E.H.Mey ex A.DC.*					+*		Tree
Mimusops elengi L.*	+*				+*		Tree
Mimusops laurifolia (Forssk.) Friis*	+*				+		Tree

Appendix. Contd.

Saxifragaceae							
Deutzia scabra Thunb.*				+*	+*		Shrub
Philadelphus x *virginalis* Rehd.*	+*				+*		Shrub
Scrophulariaceae							
Leucophyllum frutescens (Bert.) I.M.					+		Shrub
Paulownia tomentosa (Thunb.) Steud.*				+*	+		Tree
Russellia equisetiformis Schldl. & Cham.*	+*				+		Perennial herb
Simaroubiaceae							
Ailanthus altissima (Mill.) Swingle*				+*	+*		Tree
Ailanthus excelsa Roxb.	+			+			Tree
Solanaceae							
Cestrum diurnum L.					+		Shrub
Cestrum elegans (Brongn.) Schldl.					+		Shrub
Cestrum endlicheri Miers.					+		Shrub
Cestrum fasciculatum (Schldl.) Miers.	+				+		Shrub
Cestrum nocturnum L.*	+*			+*	+		Shrub
Cestrum parqui L'Hér.	+			+	+		Shrub
Iochrona cyaneum (Lindl.) Green.*					+*		Shrub
Solandra grandiflora Swartz					+		Shrub
Solanum rantonnetii Carrière*	+*				+		Climber
Solanum seaforthianum Andr.	+			+	+		Climber
Trachylospernum jasminoides (Lindl.) Lem.					+		Climber
Sterculiaceae							
Brachychiton acerifolius (Cunn.) ex F.Muell.*	+*			+*	+*		Tree
Brachychiton australis (Schott. & Endl.) A.Terrocc.*				+*	+*		Tree
Brachychiton discolor F.J.Muell.*		+*	+*	+*	+*	+*	Tree
Brachychiton populneus (Schott & Endl.)R.Br.*	+*	+*	+*		+*	+*	Tree
Brachychiton rupestris (Mitch.ex Lindl.)Schum.*				+	+		Tree
Dombeya burgessiae Gerrard ex Harv.					+		Shrub
Dombeya tiliacea (Endl.) Planch.					+		Shrub
Firmiana simplex (L.) W.Wight*					+*		Tree
Pterospermum acerifolium (L.) Willd*	+*			+	+		Tree
Pterygota alata (Roxb.) R.Br.*	+*			+*			Tree
Sterculia balanghas L.*				+*			Tree
Sterculia foetida L.*	+*			+*	+		Tree
Strelitziaceae							
Ravenala madagascariensis Sonn.*	+*				+*		Tree-like
Strelitzia alba (L.f.) Skeels*	+*				+*		Tree-like
Strelitzia nicolai Regel. & Körn.	+				+	+	Tree-like
Strelitzia reginae Ait.*	+*				+		Tree-like
Tamaricaceae							
Tamarix aphylla (L.) Karst.*	+*						Tree
Tamarix nilotica (Ehrenb.) Bunge*					+*		Tree
Taxodiaceae							
Sequoia sempervirens (D.Don.) Endl.*					+*		Conifer

Appendix. Contd.

Taxodium distichum (L.) L.Rich.*	+*				+*		Conifer
Theaceae							
Camellia japonica L.*	+*						Shrub
Tiliaceae							
Grewia asiatica L.*				+*			Climber
Grewia caffra Meissn.					+		Climber
Ulmaceae							
Celtis occidentalis L.	+				+		Tree
Ulmus parvifolia Jacq.					+		Tree
Ulmus pumila L.				+	+		Tree
Verbenaceae							
Caryopteris incana (Thunb.) Miq.					+		Shrub
Citharexylum spinosum L.*			+*	+*	+*		Tree
Clerodendrum bungei Steud.*	+*				+*		Shrub
Clerodendrum glabrum E.Mey.	+						Shrub
Clerodendrum indicum (L.) Kuntze	+			+	+		Shrub
Clerodendrum inerme (L.) Gaertn.		+			+		Shrub
Clerodendrum philippinum Schauer.*					+*		Shrub
Clerodendrum speciosissimum Van Geert ex Morr.*	+*				+		Shrub
Clerodendrum x *speciosum* Dombr.	+				+		Shrub
Clerodendrum splendens G.Don ex James*	+*			+*	+*		Climber
Clerodendrum thomsoniae Balf.*	+*				+		Shrub
Clerodendrum trichotomum Thunb.				+			Shrub
Duranta erecta L.*	+*	+*	+*	+*	+*		Shrub
Duranta lorentzii Griseb.					+		Shrub
Gmelina arborea Roxb.		+		+	+		Tree
Gmelina hystrix Schult.ex Kurz.					+		Shrub
Lantana camara L.*		+*	+*	+*	+*		Shrub
Petrea volubilis L.*	+*		+*		+*		Climber
Tectona grandis L.f.*	+			+*	+		Tree
Verbena bipinnatifida Nutt.				+			Perennial herb
Vitex agnus- castus L.			+		+		Shrub
Vitex trifolia L.		+	+	+	+		Shrub
Vitex trifolia L. 'Purpurea'					+		Shrub
Violaceae							
Viola odorata L.	+				+		Perennial herb
Vitaceae							
Ampelopsis brevibedunculata (Maxim.) Trautv.*	+*						Climber
Cissus rotundifolia (Forssk.) Vahl.					+		Succulent
Zamiaceae							
Dioon edule Lindley*	+*				+		Cycads
Dioon edule Lindley var. *rio-verdi*					+		Cycads
Dioon spinulosum Dyer.					+		Cycads
Encephalartos ferox Bertol.					+		Cycads
Encephalartos gratus Prain.					+		Cycads

Appendix. Contd.

Encephalartos sp.					+		Cycads
Encephalartos laurentianus De Wild.	+						Cycads
Encephalartos lebomboensis Verdoorn.					+		Cycads
Encephalartos natalensis R. A. Dyer & Verdoorn.					+		Cycads
Encephalartos principes R. A. Dyer					+		Cycads
Encephalartos sclavoi A.Moretti et al.					+		Cycads
Encephalartos sudanensis					+		Cycads
Encephalartos villosus Lem.	+				+		Cycads
Zamia fischeri Miq.					+		Cycads
Zingiberaceae							
Alpinia sp.					+		Perennial herb
Alpinia zerumbet (Pers.) B.L.Burtt & Rosemary M. Sm.*	+*				+*		Perennial herb
Hedychium coronarium J. G.Koenig.*					+*		Perennial herb
Hedychium gardnerianum Ker-Gawl.					+		Perennial herb
Zingiber officinalis Roscoe	+				+		Perennial herb
Zygophyllaceae							
Guaiacum sanctum L.					+		Shrub

two anonymous reviewers for commenting on a first version of this paper.

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