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Herbarium – Biodiversity of UAE

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Abstract

Plant biodiversity is a key component of a stable ecosystem that helps support life. The changing environmental conditions may have a huge effect on the plant ecosystem. Periodic studies of plant species and their adaptations may help conserve the biodiversity of UAE. Herbarium is a form of documentation of plant species living in a specific geographical area at a particular point in time. This study has attempted to document the flora of Dubai and its surroundings during the height of the pandemic in 2020 and obtain a record of its indigenous species surviving the harsh desert environment. The plants collected were recorded, classified and their statistics obtained. A total of 72 indigenous specious were documented and analyzed among which there were 7 species of trees, 28 species of shrubs, 27 species of herbs and 10 species of grasses. The indigenous species collected were studied individually in further detail and their utilization by the community was recorded. This herbarium is an exhaustive work featuring all possible indigenous species in UAE. It documents the ecology of UAE for future reference and to study and possibly prevent the damaging effects of global warming and rapid urbanization.

***Keywords*:** biodiversity; plant species; indigenous species; herbarium; plant conservation.

1. Rationale

Biodiversity is the essence of life on earth. Plant biodiversity in particular is a key component of a stable ecosystem that may support animal and human communities. UAE has a rich plant biodiversity comprising of species that have adapted to the extreme climatic conditions. Herbarium is a collection of preserved plant specimens that serves as a historical record of change in vegetation over time. Due to rapid urbanization, changing weather phenomenon due to global warming and other environmental changes many plant species may suffer the risk of extinction. The study of the existing species, their unique adaptions and special environmental conditions may help us conserve the rich biodiversity of UAE.

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2. Scope & Introduction

Herbarium serves to maintain a historical record of the plant species that may be expected to change with the changing environmental conditions. This is a simple research tool that helps us understand and conserve the flora in a specific habitat.

Herbarium is an important research tool that archives botanical diversity through time. The state of biodiversity in UAE reflects the harsh desert environment and maritime location on one end and the growing urbanization on the other end. The natural resources are continuously under intense pressure from the changes due to climactic variations and depletion of habitat with expansion of cities. Only by maintaining a record, humans may understand their deleterious effect on the environment and help formulate ways of preserving the indigenous flora. The scope of my research is to analyze the flora of UAE and to collect and document the species I may be able to find in Dubai. This is to be compared with past records and examine for changes. The research hypothesis is that the biodiversity in flora has not changed in the last 50 years indicative of good conservation efforts. Due to the corona virus pandemic it was not possible to visit different parts of UAE and all the plant specimens were collected from Dubai and the surrounding areas. It is assumed that similar plant species are found in other emirates as well due to similar climactic conditions.

3. Methods

Due to the coronavirus pandemic, direct site visits and specimen collection were performed only in the emirate of Dubai and its surroundings. The analysis of the collected specimen was done using the internet. The information was collected from different websites on the flora of UAE and the data assembled in scientific order. The trees found in UAE were first analyzed and classified. This was followed by shrubs, herbs and grasses. All of the above plant species were categorized and arranged according to their respective families. The information was then collected on each of the plant species. These include the scientific name, local name, photograph, botanical description, arrangement and shape of leaves, flowers and fruits, flowering and fruiting periods, their habitat, distribution and uses in UAE. The information collected was organized in order with clear subheadings into an interactive e-book. The literature was checked for recent studies on the flora of UAE and the findings were cross checked.

4. Data Analysis

There were a total of 72 species documented among which there were 7 species of trees, 28 species of shrubs, 27 species of herbs and 10 species of grasses.

Table 1: Summary of Flora.

FLORA	NO. OF FAMILIES	NO. OF SPECIES
Trees	4	7
Shrubs	17	28
Herbs	15	27
Grasses	2	10

The trees found in UAE were classified into 4 families.

Table 2: Families and Species of Trees in UAE.

TREES - FAMILY	SPECIES
MIMOSA (Mimosaceae)	Proposis cineraria (Ghaf tree)
	Acacia tortilis (Umbrella Thorn Acacia tree)
	Acacia ehrenbergiana (Samur tree)
	Acacia nilotica (Arabian Gum tree)
PALM (Arecaceae)	Phoenix dactylifera (Date Palm)
BUCKTHORN (Rhamnaceae)	Ziziphus spina-christi (Christ's Thorn tree)
TAMARISK (Tamaricaceae)	Tamarix aphylla (Athle tree)

The shrubs are classified into 17 families.

Table 3: Families and Species of Shrubs in UAE.

SHRUBS - FAMILY	SPECIES
SPURGE (Euphorbiaceae)	Chrozophora oblongifolia (Tannom)
	Euphorbia larica (Isbaq)
MULLUGO (Molluginaceae)	Gisekia pharnaceoides (Dedman)
	Limeum arabicum (Berjan)
BROOMRAPE (Orobachaceae)	Cistanche tubulosa (Desert hyacinth)
AMARANTH (Amaranthaceae)	Aerva javanica (Al Ara)
MILKWEED (Asclepiadaceae)	Leptadenia pyrotechnica (Broombrush)
	Calotropis procera (Sodom's Apple)
	Pentatropis nivalis (Shuntop)
DAISY (Asteraceae)	Rhanterium epapposum (Arfaj)
BORAGE (Boraginaceae)	Heliotropium digynum (Kary)
	Moltkiopsis ciliate (Callous-leaved gromwell)
	Heliotropium kotschyi (Turnsole)
CAPER (Capparaceae)	Dipterygium glaucum (Safrawi)
PINK (Caryophyllaceae)	Gymnocarpus decandrus (Ayrdah)
MORMON TEA (Ephedraceae)	Ephedra foliata (Shrubby Horsetail)
PEA (Fabaceae)	Indigofera colutea (Neela)
	Indigofera intricata (Neela)
	Crotolaria retusa
	Crotolaria aegyptiaca (Nzah)
	Baql (Rhynchosia minima)
BUCKWHEAT (Polygonaceae)	Calligonum comosum (Arta)
MADDER (Rubiaceae)	Gaillonia aucheri (Ghurman)
Salvadoraceae	Salvadora persica (Toothbrush tree)
NIGHTSHADE (Solanaceae)	Lycium shawii (Desert Thorn)
GOOSEFOOT (Chenopodiaceae)	Cornulaca monacantha (Thallag)
	Haloxylon salicornicum (Rimth)
MIGNONETTE (Orcandenus)	Ochradenus arabicus (Taily weed)

The herbs are classified into 15 families.

Table 4: Families and Species of Herbs in UAE.

HERBS - FAMILY	SPECIES
Daisy	Centaurea pseudosinaica (Hanga)
	Launaea capitata (Hawa)
	Launaea mucronate
	Atractylis carduus (White Thistle)
Borage	Ogastemma pusillum (Al Hamat)
	Arnebia hispidissima (Arabian Primrose)
Caper	Cleome amblyocarpa (Spider flower)
Pink	Polycarpaea spicata (Mukor)
	Polycarpaea repens (Kameela)
	Silene villosa (Turba)
PEA	Lotononis platycarpa (Herbeth)
Mignonette	Reseda aucheri (Dhaub)
Goosefoot	Bassia muricata (Ghabira)
	Suaeda aegyptiaca (Egyptian seablite)
Mustard	Eremobium aegyptiacum (Ghurayra)
	Farsetia linearis (Jerbah)
	Physorrhynchus chamaerapistrum (Khafji)
	Sisymbrium erysimoides (Maharraqa)
Bindweed	Convolvulus cephalopodus (Raghaili)
Gourd	Citrullus colocynthis (Desert Squash)
Cranesbill	Monsonia nivia (Maqarnah)
Neurada	Neurada procumbens (Creeping Thorn Rose)
Plantain	Plantago boissieri (Rabl)
Polygalaceae	Polygala erioptera
Bean Caper	Tribulus pentandrus (Shershir)
	Tribulus arabicus (Zahar)
	Fagonia indica

The grasses are classified under two families indigenous to UAE.

Table 5: Families and Species of Grasses in UAE

GRASSES - FAMILY	SPECIES
Poaceae	Triraphis pumilio (Zaabal)
	Centropodia forsskaolii (Qasba)
	Cenchrus ciliaris (Foxtail Grass)
	Panicum turgidum (Turgid Panic Grass)
	Pennisetum divisum (Bristle Grass)
	Stipagrostiss plumosa (Plumosa Triple-awned Grass)
	Cymbopogon commutatus (Incense Grass)
	Erasgrostis barrelieri (Love grass)
	Tragus racemosus (European Bur grass)
Cyperaceae	Cyperus conglomeratus (Dune grass)

There are a total of 72 species, trees comprise 9.7% of the total. Shrubs comprise the largest group accounting for 38.9% of the total. This is closely followed by herbs accounting for 37.5% of all indigenous plants. Grasses comprise 13.9% of the total plant species in UAE. Among the shrubs, the Pea family is the largest group consisting of 5 species which account for 17.85% of all shrubs followed by Milkweed and Borage families comprising 3 species each accounting for 10.7% of all shrubs. Among the herbs, Daisy and Mustard families are the largest group comprising 4 families each accounting for 14.8% of all herbs followed Bean Caper and Pink

families comprising 3 families accounting for 11.1% of all herbs. Among the grasses, the Poaceae family is the largest comprising 9 species which in total account for 90% of all grasses. The Sedge family comprises the remaining 10% with just one native species. The trees are the smallest group with a total of 7 species. Among the trees, Mimosa family is the largest with 4 species accounting for 57.1% of all trees. The rest all comprise 14.3% each with three species distributed over three families.

5. Discussion

Biodiversity is important and valuable for any given country or region, playing an important role in the well being of the region providing food security and economic stability. It provides food, building materials, etc and plays an important role in climate change and disaster mitigation, thus providing a lifeline for the population at large. The harsh desert environment of UAE supports different kinds of plant species which provide for grazing, medicines and also for stabilization of the sand dunes[1]. The detailed study on the flora of United Arab Emirates commenced only in the late 80s. The first monographs on the flora of UAE were published around 1987-89 as reported by author in [2]. One study had reported 501 species while the other (unpublished checklist 1996) reported 583 species, updated to 800 species in Oct 1999[2]. Recent books written on the topic describe 737 plant species. If the ones added after recent explorations are taken into account, the number of plant species found in UAE would easily cross 780[3]. The soils in UAE are found in four land forms: sand, salt flats, gravel and mountains. The soil in these regions are generally low in nutrients. Despite this fact, there has been diverse kinds of plants found in UAE, all of which have evolved to survive in the harshest of the environments. UAE is a meeting point between Indo-Asian and Afro-European regions and has rich flora with at least 731 plant species according to the convention on biological diversity[4]. Phytogenetically, UAE comprises of two different regional zones. The area to the west is a part of the Saharo-Sindian regional zone characterized by multiple widespread species including Calligonoum and Neurada. The east belongs to the Somali-Masai zone where Acacia species is widespread[2]. Even though there have been good efforts towards conservation, excessive livestock grazing and continuous urbanization and desertification have impeded these efforts. Livestock grazing in particular has resulted in severe to very severe degradation of over 44% of land in the Arabian peninsula[5]. The most endangered species are Nannorrhops ritchieana (Mazari Palm), Desmidorchis flavus, Limonium carnosum shrub and Salix acmophylla[1] (Brook willow tree). In the last few decades, UAE has lost some of its big fauna[6] despite huge conservation efforts. In 2001, Emirates Nature-WWF was established with the aim of protecting UAE's natural wealth and to ensure a sustainable future[7].

Despite the challenging pandemic conditions, we were able to document 72 indigenous desert species in and around Dubai. The identified species were classified according to the classification given in Dubai Desert Conservation Reserve website and documented in the form of an interesting e – book.

The uses of different plant species were also documented. All the species of trees are useful for both humans for different purposes and animals for browsing[8]. The fruit of the palm tree is widely consumed. The shrubs of the families Mullugo, Pink, Mormon Tea, Madder family and Crotolaria letusa of Pea family are not known to be useful to humans. The rest have varied uses ranging from medicinal benefits (Cistanche tubulosa – Broomrape family, Aerva javanica – Amaranth family, Heliotropium kotschyi – Borage family, Rhynchosia minima – Pea

family, Cornulaca monacantha and Haloxylon salicornicum – Goosefoot family) while the rest are used for diverse purposes including grazing and food preparation[9,10]. The herbs of Daisy family, Ogastemma pusillum of Borage family, Polycarpaea spicata (Mukor), and Silene villosa (Turba) of Pink family, Lotononis platycarpa of Pea family, Reseda aucheri of Mignonette family, Bassia muricata of Goosefoot family, Farsetia linearis (Jerbah), and Sisymbrium erysimoides (Maharraqa), Convolvulus cephalopodus of Bindweed family, Plantago boissieri of Plantain family, Tribulus pentandrus (Shershir) and Tribulus arabicus (Zahar) of Bean Caper family have no known uses while the rest mostly have medicinal properties or serve as human and animal food[11]. Among the grasses, all species are useful except Erasgrostis barrelieri and Tragus racemosus. The former may be used as animal fodder; however the collection may be cumbersome while the latter is considered weed[12]. Cymbopogon commutatus is used to prepare aromatic oils and Cyperus conglomeratus was widely used in the past as fuel and to make sails, ropes, baskets and mats. All the rest are highly valued for grazing.

Though rapid urbanization and desertification have been observed, the indigenous desert species were found in different locations which might be a testament to the conservation efforts taken up by the government agencies. However, the limitation of this study is that only indigenous species found in the neighbourhood of Dubai were documented and non-local varieties of plants were not considered. Another limitation is that the study suffers from inability to cover the entire country due to stringent limitation in movement during the height of the pandemic. Further studies may be undertaken in the future to confirm and widen the scope of this study.

6. Summary/Conclusion

The above compilation is a testimony to the rich botanical diversity of UAE. Even though most of UAE is a desert region, there are a wide variety of flora which support not only a thriving animal population, but also human requirements. The herbarium maintains a record of the plants living in any zone at the set period of time. It is important to maintain and review the herbarium from time to time as changing weather conditions could affect the habitat of plants resulting in their depletion over a period of time. This herbarium is an exhaustive work featuring all possible species in UAE. It is a historical record of change in vegetation over time. In some cases, plants numbers reduce and become extinct over time for varying reasons. This herbarium documents the ecology of UAE for future reference and to study and possibly prevent the damaging effects of global warming and rapid urbanization.

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