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FLORISTIC COMPOSITION OF THE GARDENS WITH REFERENCE TO ECONOMIC VALUE AND SPECIES STATUS ACCORDING TO IUCN.

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Abstract

This work amid to estimate the garden flora's composition and richness, and to determine to what extent they provide habitat for alien species, in addition to focusing on threatened species. For this evaluation, life forms, duration, geographical distribution, medicinal, economic, and environmental uses, and conservation categories are given, using literatures. Field trips during 2018-2019 were conducted to cover seven gardens in the studied area. 57 species were recorded belonging to 51 genera and 20 families, where the richest garden was S7 (29 species). Poaceae and Asteraceae had almost half the number of the recorded species (19 and 9 species respectively), and *Euphorbia* (four species) was the most represented genus. 43 species were native to Egypt, while 14 species were alien. The life form spectrum showed that the majority of species were therophytes (40 species), moreover, based on the duration and phytogeographical categories, annual species (41) and monoregional species (22 species) and Mediterranean one (34 species) were the most represented species in the study area. Medicinal plants had the most uses, while phytoremediation had the most represented environmental benefits. Furthermore, 22 species were categorized as IUCN threatened species. Our study revealed the unlimited role of the public garden in the Nile region.

Key words: Egypt, Garden, Flora, IUCN.

Introduction

One of the most uncommon types of botanical assemblages is the flora of gardens. One of the few remaining areas for the world's rapidly urbanized population to see and connect with nature is urban green spaces. City greenery is crucial for providing ecosystem services and supporting societal well-being in heavily populated and pressured metropolitan areas. The Estimation of gardens areas in Stockholm has is more than16% (Colding *et al.*, 2006), while in the UK it ranges between 22-27% (Loram *et al.*, 2007), and in Dunedin, New Zealand it rises to 36% (Mathieu *et al.*, 2007).

The potential value of gardens for enhancing biodiversity has long been recognized (Goddard *et al.*, 2009). In addition, they revealed that in developing countries, initiatives to enhance the biodiversity value of gardens by conservation NGOs and governments are now commonplace. Humans appear to have a significant influence on the composition of garden flora. This may be due to the fact that garden plants are rarely considered in terms of their environmental impact (Smith *et al.*, 2006).

There is a widespread recognition that gardens are significant for wildlife (Baines, 2000; Good, 2000; Gilbert, 2012). On the other hand, to understand how garden flora may affect wildlife, quantified descriptions of the occurrence and abundance of individual plant taxa are required (Smith *et al.*, 2006). The Plants' taxonomic or native plant status may have a role in determining the strength of the relationship between the species that are linked with it, such as nectarivores and herbivores (French *et al*., 2005), also one of the most serious risks to the world's biological diversity is the non-native species (International Union for the Conservation of Nature and Natural Resources (IUCN, 2000)., In addition, Knowing the factors impacting the size and membership of plant assemblages in gardens, as well as a quantitative description of them, would be helpful in understanding how gardens interact with the environment (Smith *et al.*, 2006).

Two principal ecological issues need to be discussed about garden flora. The first issue; there is a growing awareness of the potential usefulness of gardens in terms of biological variety (Gaston *et al.*, 2005). While the second issue is that domestic gardens are now included in numerous conservation initiatives as in the UK (" London Biodiversity Partnership, 2001), but knowledge about them is still poor. In addition Atha *et al.*, (2016) mentioned that documenting the garden's flora is useful for number of purposes. It gives useful information to the horticulturists, through which they can find out if there are any new invasive species on the horizon, which will help to avoid future incursions in the region. Furthermore, these data serve as a source of biodiversity documentation, flora, ecological research, and conservation initiatives for the garden and its surrounding areas. According to Nova *et al*., (2018), cities are home to almost 54 percent of the world's population, and ongoing urbanization, coupled with population increase, will result in an extra 2.5 billion people living in cities by 2050. Therefore, as a result of urbanization, the benefits and issues linked with gardens are expected to increase in the near future. (Coventry, 2001), making the need for such work even more urgent.

This work aims to estimate the floristic composition and its richness in Beni-Suef City gardens and to investigate the extent to which gardens provide habitat for alien species because it is widely assumed that garden flora is planted by locals. Moreover, this work is approximately the first guide for researchers who are interested in conservation efforts in our area.

Material and Methods

Study area: The Egyptian climate is arid to hyper-arid. Beni-Suef city lies between 28° 55. 626′ N 31° 26. 282′ E elev. 888 ft. (studied area) is in the southern part of the Nile delta and the upper part of the Nile valley where the climate is hyper-arid. The annual rainfall ranged between 80-200 mm year-1 during the period 2012 to 2018. (https://power.larc.nasa.gov/) (Fig. 1).

Data collection: Plant samples were collected from a total of 7 public gardens (stands) in the studied city during field trips from 2018-2019. In each garden, the wild plants were recorded, and plant samples were collected and identified by utilizing the available taxonomic and floristic literature; Tackholm, (1974) and (Boulos, 1995, 1999, 2000, 2002, 2005, 2009). Each species was assigned to alien or native categories according to (Shaltout *et al.*, 2016). Based on the position of the regenerating buds and the portions that were shed during the unfavorable season, the life forms of each identified species were determined (Raunkiaer, 1934). The growth form(trees, shrubs, perennial herbs, annual herbs, annual forbs, annual grass, perennial grass, and sedges) of each species was decided (Boulos, 1995; 1999; 2000; 2002; 2005; 2009). At each stand, the phytogeographical affinities of the recorded species were determined according to Zohary, (1973) and Wickens, (1976). The collected samples were deposited in the herbarium of the Botany and Microbiology department of Beni-Suef University (BNSU). The information on the economic uses of the recorded taxa was collected from herbalists, and previous literature (Shaltout *et al.*, 2010; Bidak *et al.*, 2015; El-Saied *et al.*, 2018). The conservation category of the collected species was checked globally according to the updated IUCN Red List 2021, (IUCN, 2021).

Result

Floristic composition: From seven gardens (Al-Shallal Garden (S1), The Zoo (S2), Abdeen Garden (S3), Administrative Prosecution Club Garden (S4), Nile Garden (S5), Doctors' Club Garden (S6) and University Garden (S7) in the studied region (Beni-Suef city), 57 taxa were collected belonging to 51 genera and 20 families, ranging from 13 to 29 species in individual gardens, 75% (43 sp.) were native to Egypt, while *ca.* 25% (14 sp.) were aliens. 79% of alien taxa were therophyte and 86% were annual.

Poaceae and Asteraceae were almost half (49%) of the recorded species. They were represented by 33% (18 genera and 19 species) and 16% (9 genera and 9 species) respectively. In addition, Fabaceae and Euphorbiaceae were represented by the same number of species (2 genera and 5 species and 5 genera and 5 species, correspondingly). On the other hand, 20 families included 33% (19 species) and each was represented by less than 4 species (Fig. 2a).

Life forms: Seven life forms were recorded in the current study (Fig. 2b). The majority of species (40 species, *ca.* 70%) were therophytes, followed by hemicryptophytes (6 species, *ca.* 10%), then geophytes (5 species, *ca.* 9%), but chamaephytes and phanerophytes were represented by an equal number of species (2 species, *ca.* 4%). In addition, hydrophytes and geophyte-halophytes were represented by one species each (*ca.* 2%).

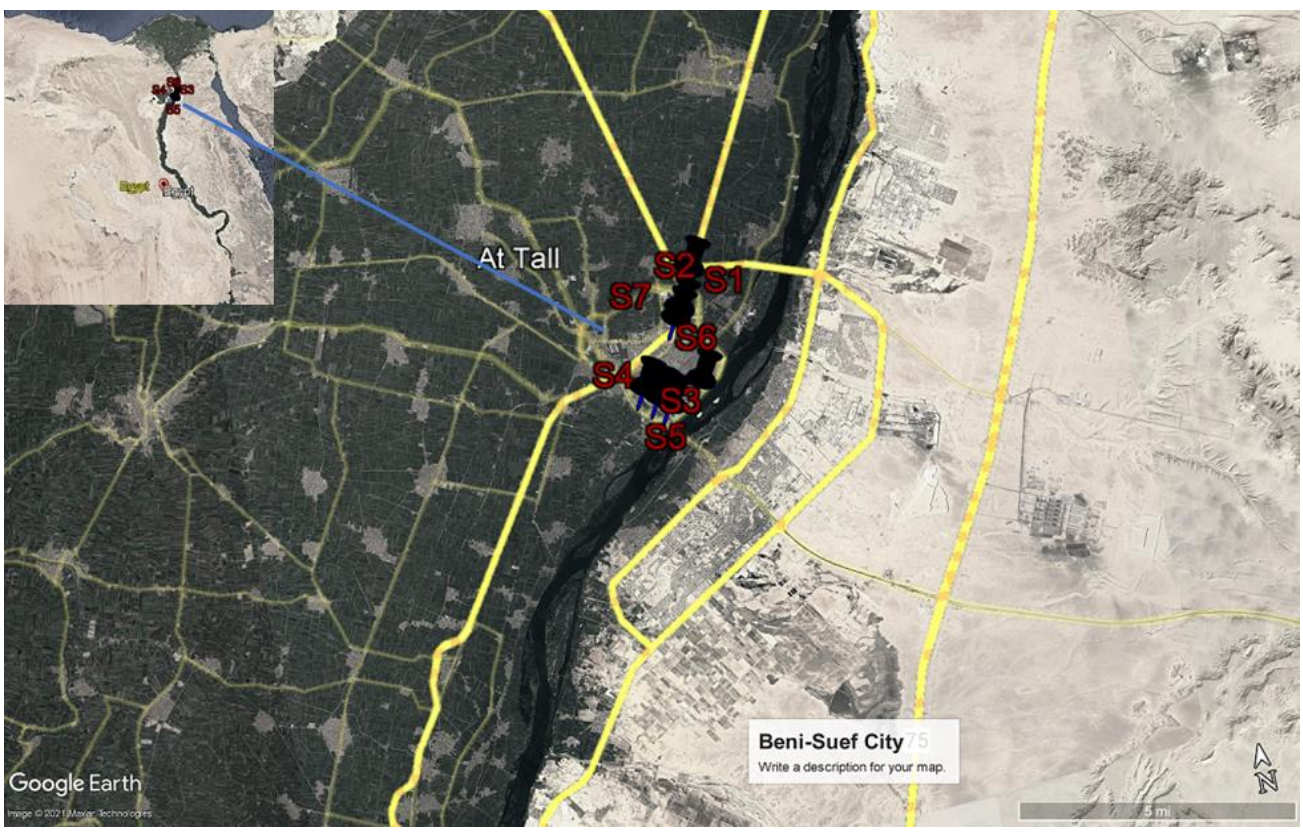

Fig. 1. Distribution map of the studied city.

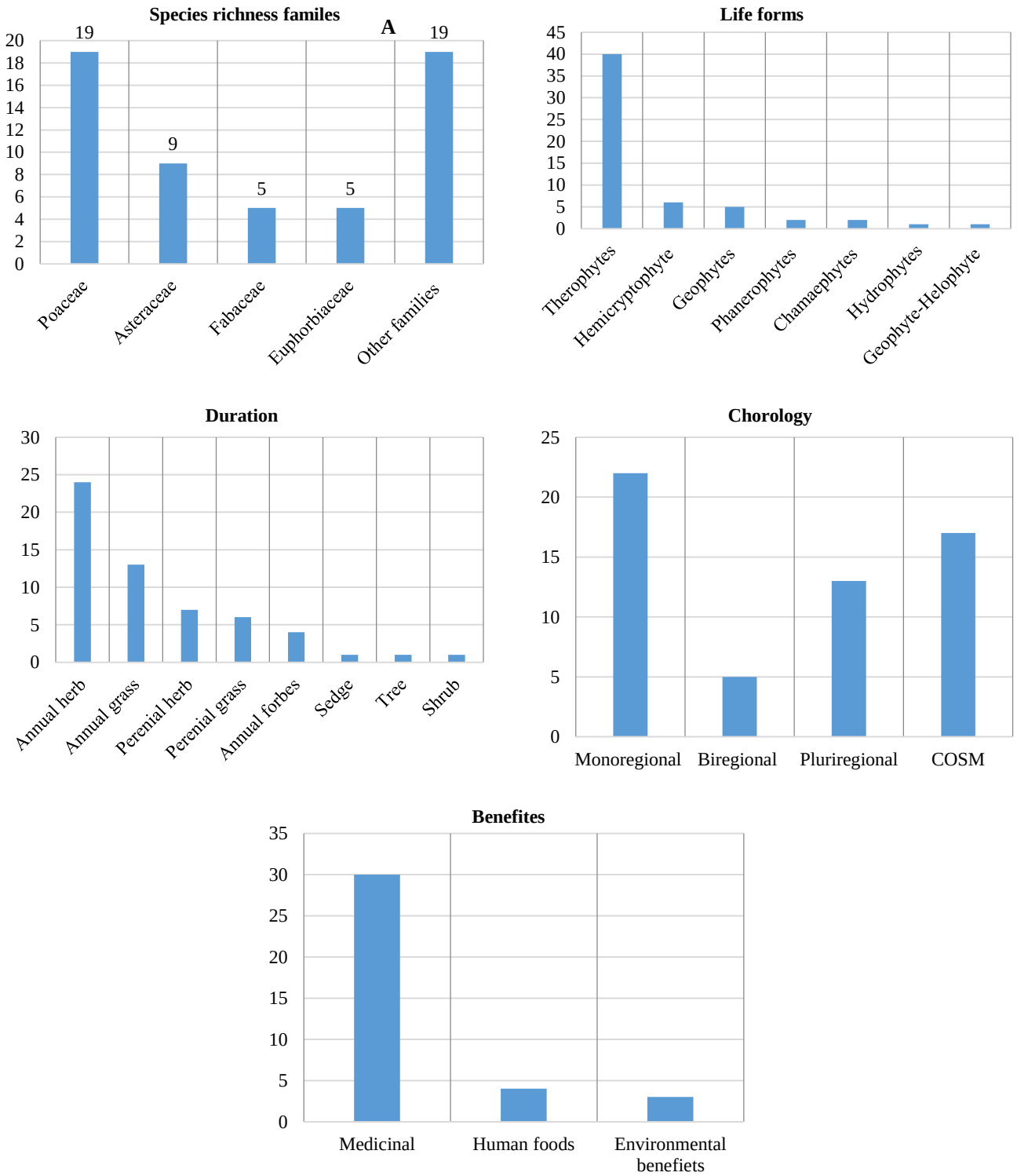

Fig. 2. (a) Species richness families, (b) Life forms, (c) Duration, (d) Chorology, (e) Benefits.

Duration: The garden flora was represented by 41 *ca* 72% annual species (24 annual herb, 13 annual grasses & 4 annual forbs), 13 species (*ca*. 22%) were perennial, but sedge, tree, and shrub each of 2% were represented by one species each (Fig. 2c).

Chorology: From the results of chorological analysis of the surveyed area (Table 2), it was revealed that 39% of the recorded species (22) were monoregional, (S5 &S6 have the most monoregional species; 10 species in each), 32% (18 species) were biregional and 40% (23) were plureregional, with their range extending across the Mediterranean, Saharo-Sindian and Sudano-Zambezian. The Mediterranean-Irano-Turanian had the most bioregional (3) species and plureregional (12) species. 41% of the monoregional species were paleotropical, followed by pantropical 32%, then Mediterranean and American 9%. The Mediterranean one were represented by 34 species (59 %). Cosmopolitan represented 30% (17 species) of the total recorded species.

Table 1. The red list evaluation of taxa of the present study according to IUCN categories (based on IUCN list 2003).

Evaluated species	IUCN categories
Poa annua L.	Least concerned
Trifolium resupinatum L. var. *minus* Boiss.	Least concerned
Plantago major L.	Least concerned
Imperata cylindrica (L.) Raeusch.	Least concerned
Avena fatua L.	Least concerned
Lolium perenne L.	Least concerned
Polypogon monspeliensis (L.) Desf.	Least concerned
Portulaca oleracea L. subsp. *Oleracea*	Least concerned
Pluchea dioscoridis (L.) DC.	Least concerned
Echinochloa colona (L.) Link.	Least concerned
Euphorbia prostrata Aiton	Critically Endangered
Phragmites australis (Cav.) Trin. ex. Steud.	Least concerned
Cynanchum acutum L. subsp. *Acutum*	Least concerned
Urtica urens L.	Least concerned
Eleusine indica (L.) Gaertn.	Least concerned
Paspalum distichum L.	Least concerned
Echinochloa crus-galli (L.) P. Beauv	Least concerned
Capsella bursa-pastoris (L.) Medik.	Least concerned
Brachiaria reptans (L.) C.A. Gardner & C.E. Hubb.	Least concerned
Medicago sativa L.	Least concerned
Gnaphalium polycaulon Pres.	Least concerned
Persicaria salicifolia (Brouss. ex Willd.) Assenov.	Least concerned
Panicum coloratum L.	Least concerned

Spatial distribution pattern of species within habitats: About 37% (21 species) namely *Urtica urens, Eleusine indica, Cyclospermum leptophyllum, Dactyloctenium aegyptium, Paspalum distichum, Dichanthium annulatum, Ricinus communis, Senecio glaucus, Echinochloa crus-galli, Capsella bursa-pastoris, Amaranthus hybridus* L. subsp. *Hybridus, Conyza bonariensis, Cichorium endivia* subsp. *divaricatum, Pseudognaphalium luteoalbum, Brachiaria reptans, Medicago sativa, Glebionis coronaria, Gnaphalium polycaulon, Persicaria salicifolia, Lepidium didymium* and *Panicum coloratum* were recorded only once. On the other hand, five species namely *Cynodon dactylon, Poa annua, Sonchus oleraceus, Euphorbia peplus* and *Cyperus rotundus* var. *rotundus* were recorded in all sites and all were native taxa. Only three genera were represented by more than one species; *Euphorbia* (*E. hirta, E. peplus, E. prostrata* and *E. heterophylla*), *Chenopodium* (*C. album* and *C. murale*) and *Amaranthus* (*A. viridis* and *A. hybridus*) and the 48 genera were represented by single species.

Economic uses: The economic uses of the recorded species were categorized into three main classes, medicinal uses which included *Urtica urens, Euphorbia peplus* and *Solanum nigrum*, human food included *Malva parviflora*, and environmental uses including (protection of soil, phytoremediation, and bioenergy production) as *Phragmites australis*.

From the recorded wild species, there were three species (5%) having more than one economic use (*Portulaca oleracea*, *Sonchus oleraceus* and *Phragmites australis*). 30 species (53% of the total species) had medicinal uses, only 4 species (7%) were used as a human food. Regarding the environmental benefits, three species (5%) offered at least one environmental benefit (Fig. 2e).

Conservation categories: The evaluation process was carried out depending on IUCN (2003-2010). Among the studied taxa, 22 species (39%) were categorized as least concern and one species (2%; *Euphorbia prostrata* Aiton) was classified as critically endangered as shown in (Table 1).

Discussion

In this study, altogether 57 species belonging to 51 genera and 20 families were collected. The four major families were Poaceae, Asteraceae, Fabaceae, and Euphorbiaceae, this was also supported by (Ahmed *et al.*, 2020) where they revealed that the families of Poaceae and Fabaceae were the most represented families in Egyptian gardens of the Nile region, also (Shaltout & Farahat, 2005) reported that Poaceae was the most represented family in their study of Qanater public park (20 sp. = 27%) followed by Asteraceae (9 sp. = 12.2%). Similar results were also obtained in the Al-Shafa Highlands in Taif, Western Saudi Arabia (Alsherif & Fadl, 2016). The wide ecological range and efficient seed dispersal capacity of the family Poaceae and the large global distribution reflect the dominance of this family.

Genera *Euphorbia* (4 species), *Amaranthus* (2 species), and *Chenopodium* (2 species) were represented by more than one species. Similar results were also obtained by Shaltout & Farahat (2005) in their study on Qanater public park who reported 4 species of *Euphorbia* followed by *Amaranthus* (3 species).

Table 2. Distribution of the recorded species in the studied area (Species arranged in descending way).

	Plant data					Sites							All sites
Stands No.	**Families**	**Duration**	**Chorotype**	**Life-Form**	**Status**	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**7**
Species No						**27**	**13**	**26**	**26**	**24**	**25**	**29**	**57**
Species recorded in all sites													
Cynodon dactylon (L.) Pers.	Poaceae	PG	COSM	G	NA	1	1	1	1	1	1	1	7
Cyperus rotundus L. var. *rotundus*	Cyperaceae	SD	PAN	G	NA	1	1	1	1	1	1	1	7
Euphorbia peplus L.	Euphorbiaceae	AH	M+IT+ES	Th	NA	1	1	1	1	1	1	1	7
Poa annua L.	Poaceae	AG	M+IT+ES	Th	NA	1	1	1	1	1	1	1	7
Sonchus oleraceus (L.)L.	Asteraceae	AH	COSM	Th	NA	1	1	1	1	1	1	1	7
Species recorded in six sites													
Convolvulus arvensis L.	Convolvulaceae	PH	PAL	H	NA	1	1	0	1	1	1	1	6
Euphorbia hirta L.	Euphorbiaceae	AH	PAN	Th	AL	1	0	1	1	1	1	1	6
Malva parviflora L.	Malvaceae	AH	M+IT	Th	NA	1	0	1	1	1	1	1	6
Melilotus indicus (L.) All.	Fabaceae	AF	PAL	Th	NA	1	0	1	1	1	1	1	6
Oxalis corniculata L.	Oxalidaceae	PH	COSM	G	AL	1	1	1	1	0	1	1	6
Trifolium resupinatum L. var. *minus* Boiss.	Fabaceae	AF	M+IT	Th	NA	1	1	1	1	1	1	0	6
Species recorded in five sites													
Corchorus olitorius L.	Tiliaceae	AH	PAN	Th	NA	0	0	1	1	1	1	1	5
Imperata cylindrica (L.) Raeusch.	Poaceae	PG	M+IT+SA	H	NA	1	0	1	1	0	1	1	5
Plantago major L.	Plantaginaceae	PH	M+IT+ES	H	NA	0	1	1	1	0	1	1	5
Species recorded in four sites													
Amaranthus viridis L.	Amaranthaceae	AH	COSM	Th	NA	0	0	1	1	0	1	1	4
Avena fatua L.	Poaceae	AG	COSM	Th	NA	1	1	0	1	0	0	1	4
Bidens pilosa L.	Asteraceae	AH	M+IT+ES	Th	AL	1	0	1	1	1	0	0	4
Cenchrus echinatus L.	Poaceae	AG	AM	Th	AL	1	1	1	1	0	0	0	4
Lolium perenne L.	Poaceae	PG	M+IT+ES	H	NA	1	0	0	1	0	1	1	4
Species recorded in three sites													
Alhagi graecorum Boiss.	Fabaceae		SA+IT	H	NA	1	0	0	0	1	0	1	3
Anagallis arvensis L.	Primulaceae	AH	COSM	Th	NA	0	0	1	1	1	0	0	3
Bromus catharticus Vahl	Poaceae	AG	M+IT+ES	Th	AL	0	1	1	0	0	0	1	3
Chenopodium album L.	Chenopodiaceae	AH	COSM	Th	NA	1	0	0	0	1	0	1	3
Chenopodium murale L.	Chenopodiaceae	AH	COSM	Th	NA	0	0	0	0	1	1	1	3
Pluchea dioscoridis (L.) DC.	Asteraceae	PS	SA+SZ	Ph	NA	0	0	1	1	0	0	1	3
Polypogon monspeliensis (L.) Desf.	Poaceae	AG	COSM	Th	NA	0	0	1	1	0	0	1	3
Portulaca oleracea L. subsp. *oleracea*	Portulacaceae	AH	COSM	Th	NA	0	0	1	1	0	1	0	3
Trigonella hamosa L.	Fabaceae	AF	M+SA+SZ	Th	NA	0	0	0	1	0	1	1	3

Table 2. (Cont'd.).

	Plant data					Sites							All sites
Stands No.	**Families**	**Duration**	**Chorotype**	**Life-Form**	**Status**	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**7**
Species No						**27**	**13**	**26**	**26**	**24**	**25**	**29**	**57**
	Species recorded in two sites												
Cynanchum acutum L. subsp.*acutum*	Apocynaceae	PH	SA	Ch	NA	0	0	0	0	1	1	0	2
Echinochloa colona (L.) Link	Poaceae	AG	PAN	Th	NA	0	0	0	0	1	1	0	2
Euphorbia heterophylla L.	Euphorbiaceae	AH	PAN	Th	AL	0	0	0	0	0	1	1	2
Euphorbia prostrata Aiton	Euphorbiaceae	AH	M+IT+ES	Th	AL	1	0	0	0	0	0	1	2
Digitaria ciliaris (Retz.) Koeler	Poaceae	AG	PAL	Th	NA	1	0	0	1	0	0	0	2
Solanum nigrum L. var. *nigrum*	Solanaceae	PH	COSM	Ch	NA	1	0	0	0	1	0	0	2
Setaria verticillata (L.) P. Beauv.	Poaceae	AG	COSM	Th	NA	1	0	1	0	0	0	0	2
Phragmites australis (Cav.) Trin. ex. Steud.	Poaceae	PG	PAN	Hy	NA	0	0	0	0	1	1	0	2
	Species recorded in only one site												
Amaranthus hybridus L. subsp. *hybridus*	Amaranthaceae	AH	COSM	Th	AL	1	0	0	0	0	0	0	1
Brachiaria reptans (L.) C.A. Gardner & C.E. Hubb.	Poaceae	AG	PAL	Th	NA	0	0	0	0	0	1	0	1
Capsella bursa-pastoris (L.) Medik.	Brassicaceae	AH	COSM	Th	NA	1	0	0	0	0	0	0	1
Cichorium endivia L. subsp. *divaricatum* (Schousb) P.D. Sell	Asteraceae	AH	M+IT	Th	NA	0	1	0	0	0	0	0	1
Conyza bonariensis (L.) Cronquist	Asteraceae	AH	M	Th	AL	0	0	0	0	0	0	1	1
Cyclospermum leptophyllum (Pers.) Sprague	Apiaceae	AH	AM	Th	NA	1	0	0	0	0	0	0	1
Dactyloctenium aegyptium (L.) Willd.	Poaceae	AG	PAL	Th	NA	0	0	1	0	0	0	0	1
Dichanthium annulatum (Forssk.) Stapf	Poaceae	PG	PAL	H	NA	0	0	0	0	0	0	1	1
Echinochloa crus-galli (L.) P. Beauv.	Poaceae	AG	M+IT+ES	Th	NA	1	0	0	0	0	0	0	1
Eleusine indica (L.) Gaertn.	Poaceae	AG	PAL	Th	AL	0	0	0	0	1	0	0	1
Glebionis coronaria (L.) Tzvelev	Asteraceae	AH	M	Th	NA	0	0	0	0	1	0	0	1
Gnaphalium polycaulon Pres.	Asteraceae	AH	COSM	Th	NA	0	0	1	0	0	0	0	1
Lepidium didymum L.	Brassicaceae	AH	COSM	Th	NA	0	0	0	0	1	0	0	1
Medicago sativa L.	Fabaceae	AF	M+IT+ES	Th	AL	0	0	0	1	0	0	0	1
Panicum coloratum L.	Poaceae	AG	S-Z	G	AL	0	0	1	0	0	0	0	1
Paspalum distichum L.	Poaceae	PG	PAN	G	NA	1	0	0	0	0	0	0	1
Persicaria salicifolia (Brouss. ex Willd.) Assenov	Polygonaceae	PH	PAL	G-H	NA	0	0	0	0	0	0	1	1
Pseudognaphalium luteoalbum (L.) Hilliard & B. L. Burtt	Asteraceae	AH	COSM	Th	AL	0	0	0	0	1	0	0	1
Ricinus communis L.	Euphorbiaceae	TR	PAL	Ph	AL	0	0	1	0	0	0	0	1
Senecio glaucus L.	Asteraceae	AH	M+IT+SA	Th	NA	0	0	0	0	0	1	0	1
Urtica urens L.	Urticaceae	AH	M+IT+ES	Th	NA	0	0	0	0	0	0	1	1

NA, native; AL, alien; Duration are PG: perennial grass, AG: annual grass, AH: annual herb, SD: sedge, PH: perennial herb, AF: annual forb, PS: perennial shrub, TR: tree, the life forms are: G, geophytes; Th, therophytes; H, hemicryptophyte; Ph, phanerophytes; Ch, chamaephytes; Hy, Hydrophyte; He, hemi-cryptophytes and the chorotypes are: COSM, cosmopolitan; M, mediterranean; IT, Irano-Turanian; ES, Euro-Siberian; PAN, Pantropic; PAL, Plaeotropic; SA, Saharo-Arabian; AM, American; SZ, Sudano-Zambezian

The most frequent species in the present study were the native ones (75%), and these were also the most common in the country, in addition, the garden is considered as a refuge to the native species that aren't as common in the rest of the country. While Smith *et al*., (2006) considers that back the richness of native elements in gardens is due to the abundance of leaf-miners, which are often specialized herbivores. This indicated that in the garden, native fauna will be successful against aliens (Owen & Whiteway, 1980).

In this study it was found that the dominant species were therophytes (40 sp. 70%) like *Poa annua* and *Euphorbia peplus* followed by Hemicryptophytes (six sp. 10%) this might be attributed to the fact that this life form possesses a high reproductive capacity and wider ecological range and morphological and genetic plasticity than biennials and perenials (Shaltout & Farahat, 2005), this was also aligned with Wickens (1992) where he explained the aridity of Egyptian climate was the cause in the prevailance of therophytes. moreover, Grime, (2001) mentioned that the high percentage of therophytes was due to the human activities and extensive grazing favouring species with a short life cycle, on the other hand Jankju *et al*., (2011) consider that Hemicryptophytes lose their aboveground parts but therophytes remain as seed during summer and all winter times. It was found that hydrophytes had a low representation (one sp. 2%) in the study area and this was also observed by (Smith *et al.*, 2006) in their works on UK gardens.

The dominance of annual elements (72%) in the study area, maybe attributed to the open environment which usually supported the growth of plants compared to the forests (Sapkota *et al*., 2017). On the other hand, trees and shrubs each represented (2%) of the total species, was in line with Bedair *et al*., (2020) findings where they mentioned that in Egyptian flora, the trees and shrubs were represented by 9.9% of the total species. Zahran & El-Ameir (2013) in their study also mentioned that the natural weather of the Egyptian flora supported few trees and shrubs. This could be attributed to almost (96% of the total area) Egypt being mainly desert (Bedair *et al.*, 2020).

The Phytogeographical affinities of the recorded species at the present study showed that monoregional taxa had the highest contribution (39%) followed by bioregional and plurregional (32%) then cosmopolitan (30%).

Egypt lies on the borderline between the Asiatic and African continent therefore there are number of species related to different chorotype categories (Amer *et al.*, 2015), in addition El-Hadidi (1993a) revealed that Egypt's natural vegetation is African in origin: Sudano-Zambazian elements, Afro-Asiatic: Saharo-Sindian elements, Euro-Asiatic: Mediterranean elements, in addition to some taxa of western Asiatic affinities Irano-Turanian elements are also found. Moreover, it was recorded that cosmopolitan, paleotropic and pantropic were 58% of the total recorded species, this showed that human disruptions were simply affecting the floristic structure of the study area. (Abd El-Ghani *et al.*, 2011). This was also supported by El-Hadidi (1993a) where he demonstrated that the weed flora of Egypt was represented by a high percentage of widely distributed cosmopolitan, paleotropic and pantropic elements. Also, the high percentage (32% bioregional + pluriregional) elements could be attributed to the human activities that were responsible for the establishment of widespread weeds. On the other hand, the mixture of different floristic elements like Mediterranean, Irano-Turanian, Saharo-Sindean, and Sudano-Zambezian representing a number of species could owe to human impact and the potential of some floristic elements from different phytogeographical regions reaching the area under question (Bedair *et al.*, 2020).

As a result of human activity, plant threats in the world increase continually (IUCN, 2003, 2010). Among the actions that are well documented and lead threats are, over collection, overgrazing, climate change, loss of habitat, and poor land management. Most studies suggest that the rate at which scientists, policymakers, and land managers respond is slower than the plant species are being lost (IUCN, 2003, 2010).

Taxa recorded from the study area and have been listed in the IUCN red list (10 least concerned and 1 critically endangered) (Table 1). These species are more vulnerable and need comprehensive studies on the population trends to conserve the biodiversity.

Economic uses: Thirty-six of the recorded species (63%) have at least one actual economic use. The most represented category was of the medicinal plants represented by 30 species (ca. 53%), *Urtica urens* is used as expectorants, rheumatism, hemorrhoids, purgatives, diuretics, hemostatics, vermifuges and for treatment of eczema, hyperthyroidism, and cancer (Kavalalı *et al.*, 2003). *Euphorbia peplus* is used for chest diseases. But a decoction of *Solanum nigrum* is used as a wash for burns and as a vaginal injection. *Phragmites australis* is used for abscesses, arthritis, bronchitis, cancer, cholera, cough, diabetes, dropsy, dysuria, fever, gout, hematuria, hemorrhage, leukemia, nausea, rheumatism, sores, thirst, and typhoid (Eid *et al.*, 2010). Moreover, the whole plant of *Cynanchum acutum* is used as Antimicrobial and antioxidant activities (Demir *et al.*, 2011), on the other hand, the flowering branches of *Bidens pilosa* is used in cuts and wounds (Marshall, 2011), while, the leaves of *Cichorium endivia* stimulates bile secretion, tonic and digestive troubles (Bellakhdar, 1978). Moreover, the flowering branches of *Erigeron bonariensis* (=*Conyza bonariensis*) are used as diuretic (Fourment & Roques, 1941), whereas, the flowering branches of *Glebionis coronaria* are considered a source of aromatic and ornamental (Bidak *et al.*, 2015). The whole plant of *Pluchea dioscoridis* is used as astringent, antipyretic, anti-inflammatory, hepatoprotective diaphoretic in fevers, smooth muscle relaxant, nerve tonics laxatives and for the treatment of dysentery, lumbago leucorrhoea, dysuria hemorrhoids, gangrenous ulcer and disorders causing cachexia (El Zalabani *et al.*, 2012). The leaves of *Pseudognaphalium luteo–album* , *Cyperus articulatus* and *Senecio glaucus* are used as antimicrobial activity (Aderogba *et al*., 2014). The leaves of *Sonchus oleraceus* is used in

treatment of malaria (Namukobe *et al.*, 2011), furthermore, the whole plant of *Capsella bursa-pastoris* is used as Vaso-constrictor, uterine problems and astringent (Lemordant *et al.*, 1977), whole plant of *Chenopodium album* is used as gastrointestinal disorders (Marshall, 2011), flowering branch of the *Chenopodium murale* is used as Aromatic source and edible food (Bidak *et al.*, 2015) On the other hand the roots of the *Convolvulus arvensis* is used as antihemorrhagic (Bellakhdar, 1978) but tubercles of *Cyperus rotundus* is used as diuretic, analgesic, scorpion stings, analeptic, anthelmintic, carminative, stomachic, stimulant and sedative (Boulos, 1966). The whole plant of *Euphorbia heterophylla* is used as remedies against several diseases and complaints such as cancer, diabetes, diarrhea, heart diseases, hemorrhages, hepatitis, jaundice, malaria, ophthalmic diseases, rheumatism and scabies, while the whole plant of *Euphorbia prostrata* is used to cure diabetes, diarrhea, heart diseases, hemorrhages, hepatitis, jaundice, malaria, ophthalmic diseases, rheumatism and scabies (Mughal *et al*., 2010), moreover, the leaves of *Oxalis corniculata* are used in gastrointestinal disorders (Marshall, 2011), whereas, the flowering branches of *Avena fatua* are 30used as diuretic, treatment of some pulmonary diseases, vulnerary, tonic and skin diseases (Hassan, 2005), also the whole plant of *Dactyloctenium aegyptium* is used as antimicrobial, antioxidant, reproductive, cytotoxic, antidiabetic and gastointestinal effects (Al-Snafi, 2017a). On the other hand the grain of *Echinochloa colona* was recently discovered that it had wound healing, antioxidant, and antibacterial properties, and could help in spleen and bleeding disorders (Sumitra & Parul, 2018), while that of *Echinochloa crusgalli* is used as antidiabetic, anticancer, antioxidant, antimicrobial hypolipidemic and anti-obesity effects (Al-Snafi, 2017b). Similarly the whole plant of *Setaria verticillata* is used as anti-inflammatory, antithrombotic, anti-oxidant, hepatoprotective and anticarcinogenic activities (Shivakoti & Ramesh, 2015). In addition the flowering branches of *Persicaria salicifolia* is used for antioxidant activity and antitumor (El-Anwar *et al.*, 2016), whereas , the whole plant of *Portulaca oleracea* is used as diuretic, abscesses, anaphrodisiac, vermifuge, refreshing agent and antidiabetic (Nauroy, 1954), while, the flowering branches of *Anagallis arvensis* are used as nephritis, insect bites, jaundice, diuretic, painful wounds, bile wound healing, expectorant, chest and urination disease (Safa *et al.*, 2013).

Out of 57 taxa, four taxa have vegetative and underground parts that are used as human food; amongst fresh leaves and young shoots of *Malva parviflora* are cooked as a vegetable dish (Shaltout *et al.*, 2010), whereas, fresh young shoots and leaves of *Portulaca oleracea* are eaten raw as a salad or cooked as a vegetable (ALEiswi & Takruri, 1989), also the fleshy young stems of *Sonchus oleraceus* are eaten raw (Shaltout & Ahmed, 2012) in addition the underground parts of *Phragmites australis* is sometimes eaten (Shaltout & Al-Sodany, 2000).

Many traditional handcrafts depend on non-agricultural activities. Women produce these for household consumption (Seif El-Nasr & Bidak, 2005). The strong fibrous culms or leaves of *Phragmites australis* are used in weaving mats, chair bottoms and screens, in thatching and brackets, and the construction of barrels and casks (Shaltout & Ahmed, 2012).

Three species have environmental benefits, *Cynodon dactylon* is a mat forming species that protect soil from erosion, *Phragmites australis* had now drawn international attention due to its capacity for phytoremediation of water pollution (Eid *et al.*, 2010) and *Ricinus communis* has the same ability for phytoremediation and bioenergy production and also its ability to grow on heavily polluted soil (Abdelsalam *et al.*, 2019), in addition, *Pluchea dioscoridis* is considered as a hyperaccumulator for Fe and Cr (Ahmed *et al*., 2018; Eid & Shaltout *et al.*, 2016).

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