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Floristic features of plant species associated with *Leucaena leucocephala* (Lam.) de Wit in El-Dakahlia Governorate, Egypt.

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AbstractEgypt's flora is dynamically changing over time. Egypt has serious environmental problems mainly due to climate change in the last few decades that's rapidly increased the biotic invasion process. The cons resulting from plant invasion are massive, as they intervene in the socio-economic system, animal, human health and region's food security. *Leucaena leucocephala* (Lam.) de Wit is an invasive weed listed among the world's 100 worst invaders. After planned visits to the diverse sites of El-Dakahlia Governorate, 140 stands (2×5 m each) were chosen for sampling the types of vegetation associated with *L. leucocephala*. The entire number of plant species in this study was 24 species classified into 23 genera and 13 families. The total number of plant species under canopy are 21 species (9 annual and 12 perennial species) and 20 species (8 annual and 12 perennial species) outside canopy. The dominant families were Poaceae, Convolvulaceae, Chenopodiaceae, Euphorbiaceae, Asteraceae and Fabaceae. The other families were represented 46.2% of all plant species recorded in this study. The majority of the recorded species were therophytes, followed by geophytes, while chamaephytes attained the lowest value of life-forms.

keywords: *Leucaena leucocephala*, Nile Delta, flora, life form, chorotype.

1.Introduction

Egypt occupies the northern corner of Africa; it connects two continents with each other [1]. Egypt's flora is dynamically changing over time. Changes may be naturally occurring or through human influence, that recently has played a vital role. Low productivity and high levels of risk due to climatic changes. This should be considered in further future studies. Different habitats found in Egypt support numerous plant species' biodiversity.

Egypt has serious environmental problems mainly the climate change in recent decades has accelerated the process of biotic invasion. The plants' movement from a certain area of the universe to the another has become prevalent and frequent owing to preferable trade and transport facilities. Also, the specific site conditions and species included must be considered before drawing conclusions about the value of a particular plant. Plant species moving from certain geographical region to another (either intentionally or accidentally), establishing and proliferating there and menacing native habitats, ecosystems and species are referred to as invasive alien plants or as invasive plants [2]. Vegetation plays a very vital role in sustainable management by maintaining biodiversity and conserving the environment [3].

Leucaena leucocephala is an example of that plant invasion became a universal problem which has taken charge of many biotic problems environmental changes, biodiversity changes, species hazard and the nuisance of ecosystem processes intrinsic to human welfare [4].

L. leucocephala is most likely to have the most economically salient species in the genus Leucaena. It is in the tribe Mimoseae of the

subfamily Mimosoideae of the family Fabaceae (Leguminosae). The genus *Leucaena* has twenty-two species divided into two named hybrids and six intraspecific taxa. It comprises three subspecies. The common type has two northerly growing and highly branched, and the giant type is a tree-like in growth, that is erect, and lightly branched. These variants were recognized as definite subspecies *leucocephala*, *glabrata* and *ixtahuacana*. It's not well determined the first time for *L.leucocephala* to be recorded in Egypt. It could be introduced with other ornamental plants to be used for soil stabilization or shading [5]. This study aimed at demonstration of floristic features of associated plant species in the community of *Leucaena leucocephala* in Dakahlia Governorate, Egypt.

2. Materials and methods

2.1. Study area

El-Dakahlia Governorate is situated in the downstream of the Damietta branch of the Nile River at 30^0 5 ^{0} N– 31^0 5 ^{0} N latitude and 30^0 E – 32^0 E longitude to the north east direction of the Nile Delta region of Egypt Fig. (1). El-Dakahlia Governorate is bounded by five governorates and northly by the Mediterranean Sea. El-Sharkia Governorate at the east, El-Gharbia Governorate at the west, Damietta Governorate from the north east, Kafr El-Sheikh from the north west and El-Qalyubiya Governorate from the south. El-Dakahlia Governorate comprises 18 districts. El-Dakahlia Governorate has a total average area of 3459 km2. The soil of the Nile Delta is heavy in texture and the deposits concealing the Delta are approximately about 10.9 m thick. These deposits are mainly consisted of many formations such as silt, clay, sandy clay with biotite, magnetite and limestone. Egypt's fertility is based primarily these deposits [6]. El- Dakahlia Governorate's plant life is mainly depending on the Nile water of the Damietta branch and partly on winter rainfall.

2.2. Estimation of plant species

After planned visits to the diverse sites of El-Dakahlia Governorate from January 2017 to December 2018. 140 stands under and outside canopy of *Leucaena leucocephala* tree (2×5 m each) according to the lowest area occupied under canopy and also the same outside canopy were chosen for sampling the vegetation types in the discrete habitats. The chosen stands were distributed in the study area to maintain each habitat type's local physiographic variations and a vast vegetation variations' sampling. In delimiting each stand a sensible level of visible physiographic and physiognomic homogeneity and the least degree of disturbance were established.

Fig 1: Map of El-Dakahlia Governorate the showing different selected districts.

3. Results and Discussion

3.1. Life-Span of Plant species

Plant species found in the study area are presented in Table (1). It showed that, the entire number of plant species in the present study was 24 species. These species were arranged as shown in Fig. (2) into two major groups according to their life-span: 10 annual species (41.66 %), and 14 perennial species (58.33%). Generally, the species were classified under the canopy of *Leucaena leucocephala* into two major groups according to their life-span: 12 perennial species representing 57.14% and 9 annual species and also, outside the canopy 12 perennials representing (57.14%) and eight annual species which are mostly either with woody or tuberous underground parts that are herbaceous and few are shrubs. A transient state in plant succession is the presence of annual species before the eventual perennial's dominance. The dominance of perennial species than annual species is due to their higher root and leaf tissue density, efficient management of their nutrient resources [7].

This reflects a massive adaptation of perennial species to survive when exotic invasive species

appears. They have a survival pathway in order to stabilize the C input and output ratio under the expanded warming through physiological adjustments, escalated losses of C can reduce their competitiveness and even their survival [8].

3.3 Life-Forms of Plant species in the Study Area

In accordance with the life-form illustration and classification of Raunkiaer (1934), the plant species' life-form mentioned in the present study were grouped into six types as shown: chamaephytes, geophytes, hemicryptophytes, nanophanerophytes, phanerophytes and therophytes Table (1) & Fig. (2). The preponderance of the documented species were therophytes, followed by geophytes, then the minimal value of life-forms was documented as chamaephytes which are shown in Fig. (2).

Therophytes' dominance over other divergent life forms needs high nutrient input to enhance their prompt growth as they have a short life period [9]. This enabled them to combat the fluctuation of the cultivation system, topography variation and biotic influence. [10]. Also, they were able to set seeds in the absence of the pollinators visit [11]. The geophyte abundance has higher habitats in accordance with high variant of resource availability and seasons of a short growing cycle assembling that in Mediterranean [12].

3.4 Floristic analysis

The overall number of documented plant species was 24 species belonging to 13 families and 23 genera Fig. (4). The major recorded families were Poaceae (11 species), Convolvulaceae (6 species), Chenopodiaceae, Euphorbiaceae (4 species), Asteraceae, Fabaceae (3 species), Aspleniaceae, Boraginaceae, Meliaceae, Apocynaceae, Portulacaceae, which collectively represented about 46.2% of the overall documented plant species. The floristic categories of the families in the study area are shown in Fig. (3). The chorotypes in the family Poaceae were six species including both Pantropical and Cosmopolitan (2 species) and Mediterranean Palaeotropical and Naturalized & Cultivated which were characterized by only one species each. The family Convolvulaceae included three species, the chorotypes Pantropical, Tropical and Cosmopolitan which were each represented by one species. While, Asteraceae, Chenopodiaceae, Euphorbiaceae, Fabaceae were represented by two species comprising Cosmopolitan, Sudano-Zambezian Saharo-Sindian, Irano-Turanina, Pantropical, American and Australian. The rest of the families were distinguished by one species Table (1).

The floristic analysis of the studied area was represented in Fig. (3) affirmed that under canopy about 33.3 % of the overall number of recorded species were Cosmopolitan and Pantropical (4 species = 19.1 %) Other floristic categories were poorly represented, as they were represented by a little number of species. On the other hand, outside canopy Cosmopolitan were about 30 % and Pantropical were 15 % as shown in Fig. (3&4).

This agrees more or less, with the findings of many authors: such as in concerning the floristic structure of the Mediterranean Africa [13], Mashaly (1987) regarding the flora of Dakahlia -Damietta coastal district. Recently, on the vegetation of the north part of the Nile Delta and the floristic features [14&15]. On the vegetation changes in north Nile Delta, within two decades [16]. Egypt is the focal point of the floristic elements presented in four phytogeographical districts: The Asiatic Irano-Turanian, African Sudano-Zambesian, the Euro-Afro-Asiatic Mediterranean and the Afro-Asiatic Sahro-Sindian [17].

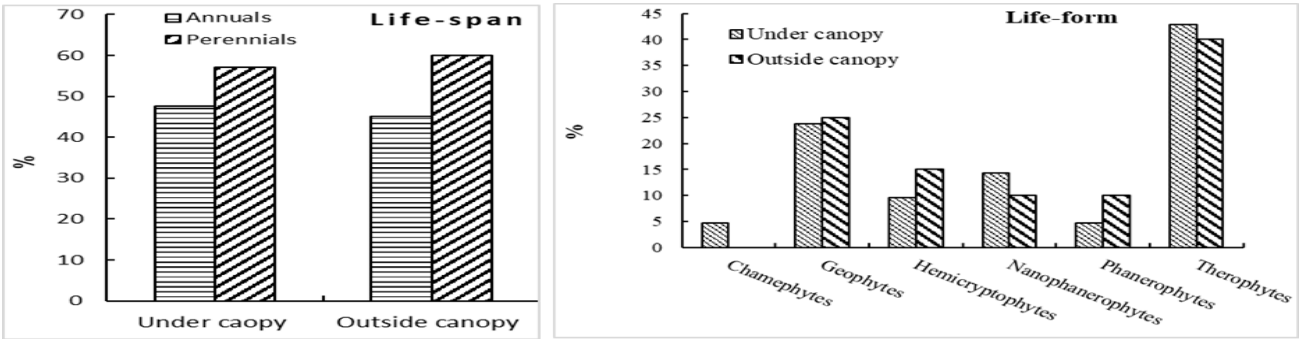

Fig. 2. Plant life-span and life-form of the studied area

Table (1). Floristic composition of associated species with *Leucaena leucocephala*.

No	Plant species	Under canopy	Outside canopy	Family	Life form	Floristic category
A- Perennials:						
1	*Acacia saligna* (Labill.) H.L.Wendl.	+	-	Fabaceae	Nph	AUS
2	*Arundo donax L.*	+	+	Poaceae	G	Cult & Nat
3	*Asplenium ceterach* L.	-	+	Aspleniaceae	H	ME+SA
4	*Convolvulus arvensis* L.	+	+	Convolvulaceae	H	COSM
5	*Cynodon dactylon* (L.) Pers.	+	+	Poaceae	G	PAN
6	*Heliotropium curassivicum* L.	+	-	Boraginaceae	Ch	NEO
7	*Imperata cylindrica* (L.) Raeusch	+	+	Poaceae	G	ME+PAL
8	*Ipomoea carnea* Jacq.	+	+	Convolvulaceae	G	PAN
9	*Ipomoea cairica* (L.) Sweet	+	+	Convolvulaceae	H	Tro
10	*Leucaena leucocephala* (Lam.) de Wit	+	+	Leguminosae	Ph	Am
11	*Melia azedarach* L.	-	+	Meliaceae	Ph	IR-TR +SA-SI
12	*Nerium oleander* L.	+	+	Apocynaceae	Nph	COSM
13	*Phragmites australis* (Cav.) Trin. Ex Steud.	+	+	Poaceae	G	COSM
14	*Pluchea dioscoridis* (L.) DC.	+	+	Asteraceae	Nph	S-Z+SA-SI
B- Annuals:						
15	*Amaranthus lividus* L.	+	+	Amaranthaceae	Th	PAL
16	*Bassia indica* (wight) A. J. Scott	+	+	Chenopodiaceae	Th	S-Z+IR-TR
17	*Chenopodium murale* L.	+	+	Chenopodiaceae	Th	COSM
18	*Echinochloa colona* (L.) Link	+	-	Poaceae	Th	PAN
19	*Euphorbia heterophylla* L.	+	+	Euphorbiaceae	Th	PAN
20	*Malva parviflora* L.	+	+	Euphorbiaceae	Th	ME+IR-TR
21	*Portulaca oleracea* L.	-	+	Portulacaceae	Th	COSM
22	*Setaria verticillata* (L.) P.Beauv.	+	+	Poaceae	Th	COSM
23	*Solanum nigrum* L.	+	+	Solanaceae	Th	COSM
24	*Sonchus oleraceus* L.	+	-	Asteraceae	Th	COSM

Th	Therophytes	COSM	Cosmopolitan
Ch	Chamephytes	PAN	Pantropical
Nph	Nanophanerophytes	PAL	Palaeotropical
H	Hemicryptophytes	NEO	Neotropical
He	Helophytes	ME	Mediterranean
Hy	Hydrophytes	TRO	Tropical
G	Geophytes	SA-SI	Saharo-Sindian
P	Parasites	IR-TR	Irano-Turanina
Tr	Tropical	S-Z	Sudano-Zambezian
Ph	Phanerophytes	CUTL. & NAT.	Naturalized & cultivated
AM	American	AUS	Australian

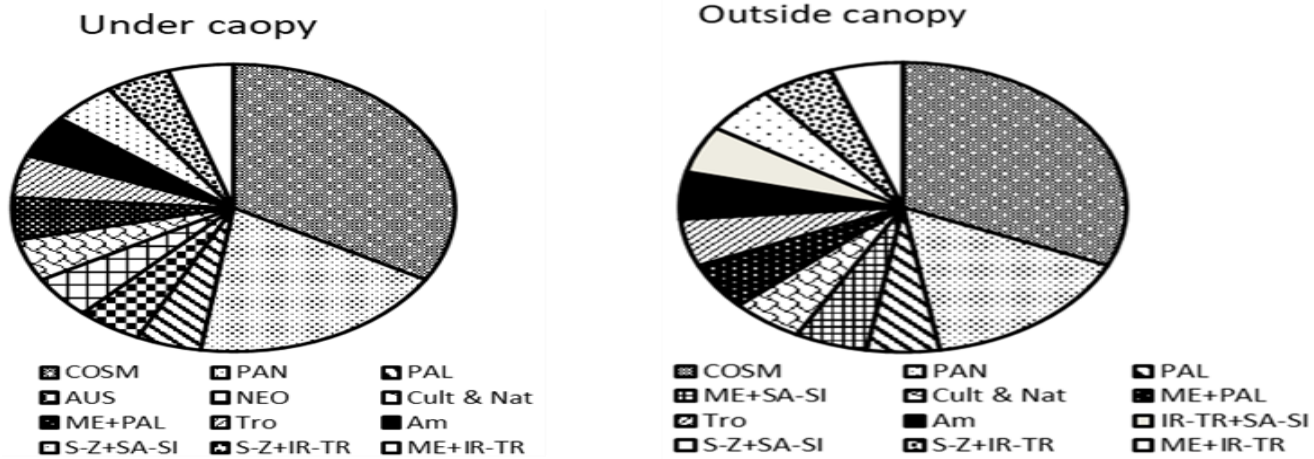

Fig. 3. The principal chorotypes (floristic categories) of the plant species recorded in the studied area.

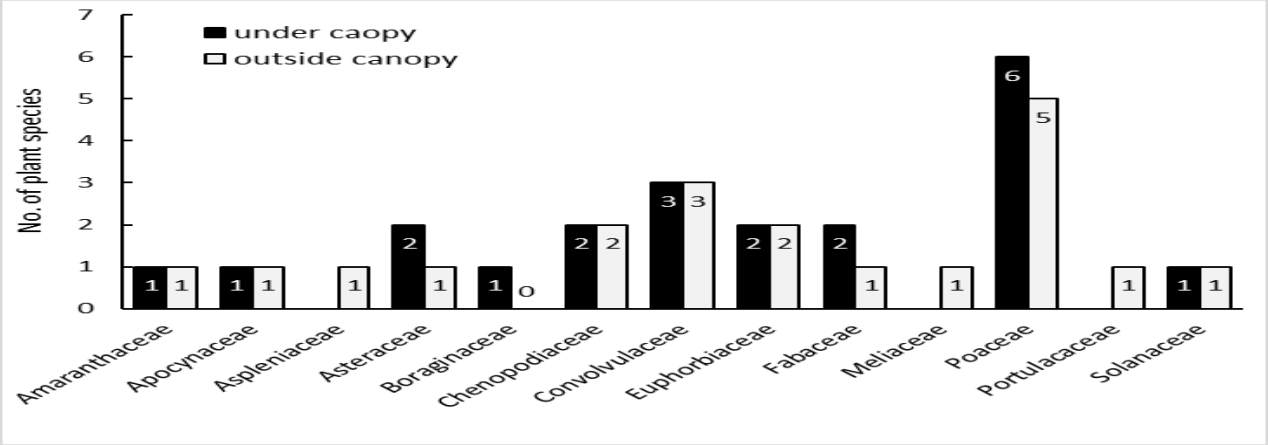

Fig. 4. The families of the plant species recorded in the studied area.

4. Conclusion

Egyptian floristic components may be found in minimally four phytogeographical regions: The Asiatic Irano-Turanian, African Sudano-Zambesian, the Euro-Afro-Asiatic Mediterranean and the Afro-Asiatic Sahro-Sindian. The total number of the mentioned plant species surveyed in the present study was 24 species belonging to 23 genera and related to 13 families. The major families were Poaceae, Convolvulaceae, Chenopodiaceae, Euphorbiaceae, Asteraceae and Fabaceae in the selected area. The preponderance of the recorded species were therophytes, followed by geophytes, then chamaephytes has the minimal value of life-forms. In general, all ecosystems in the research area had Cosmopolitan, Paleotropical and Pantropical features that were clearly comparable.

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