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Original article

Floristic Diversity and Vegetation in Belbies center Al-Sharkia governorate, Egypt

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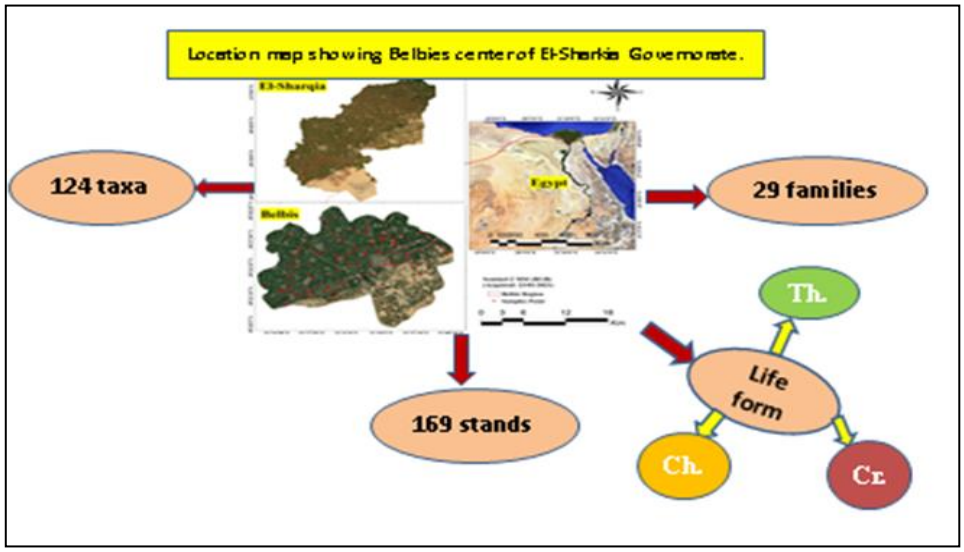
ABSTRACT

Belbies Center in Al-Sharkia Governorate was the subject of a floristic survey and phytogeographical investigation. In the 169 sectors, 124 species belonging to 80 genera and 29 families were recorded. Twenty five percent of the recorded family belonged to Poaceae (Gramineae). According to these findings, therophytes, which comprised 87 species and accounted for 70.61% of the recorded species, were the dominant life form. Additionally, chorology showed that the monoregional area, where these elements make up cosmopolitan species accounted for 31 species in total (25% of all species). In this investigation, 84 new species that had not been recorded before in the same area were illustrated.

Graphical abstract



1. Introduction

Al-Sharkia region is the third most populated governorate in Egypt. It contains around 60% of Egypt's productive land [7] and has three significant sectors in the north, middle, and south [18]. That area is associated with the Egyptian Delta, which is regarded as one of the oldest and most prosperous in the entire globe. The date palm was mentioned and emphasized in earlier studies on weeds in Egyptian orchards. The composition and spread of the species have been supported by the many investigations on the weed society [22]. The recently recovered land had weed colonies, which several investigators had discovered.

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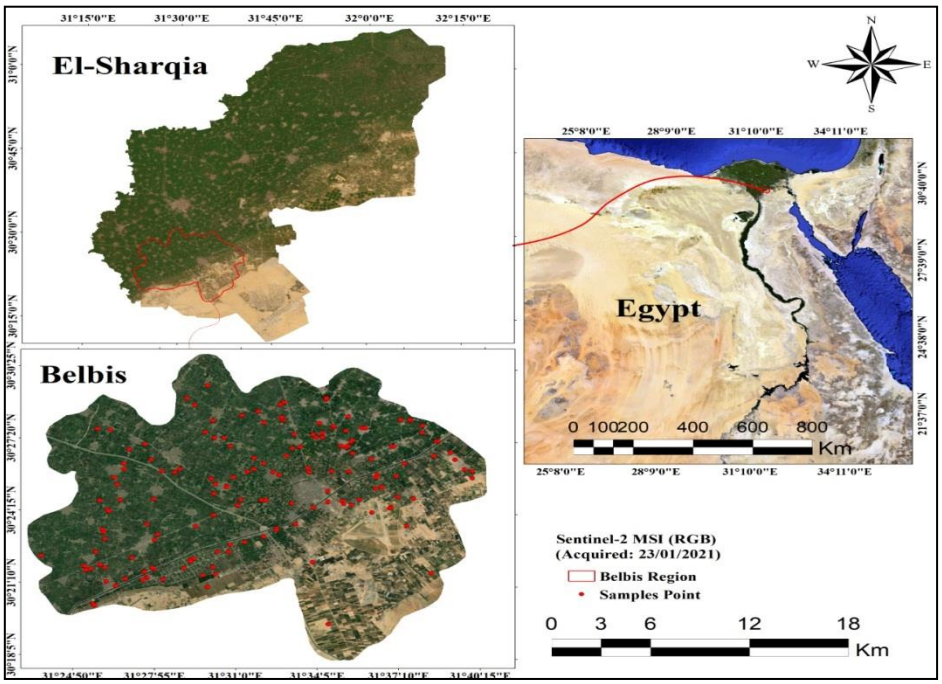
There were around 270 species of weeds scattered across the Delta region, according to an estimate of author name. The Mediterranean region is recognized by its towns and summer resorts and is encircled by water [34]. Over the Nile Delta, habitat degradation is one of the greatest dangers to plant species. Numerical techniques might be a helpful tool to illustrate the relationships between certain crop and weed assemblages [26]. The cultivated crops at Egypt's El-Tina Plain that were linked to weed buildup were investigated, and the findings were assessed by author name. El-Sharkia's most recent survey was carried out by author name. Within Delta's agricultural zones, weed clustering was connected to human presence [15]. Conversely, cultivated land habitats can include citrus, grape, and banana orchards, as well as clover, wheat, and potato crops in the winter, cotton, maize, and rice in summer, and potatoes, wheat, and cotton in winter. The floristic characteristics of the three main ecosystems in the province of EL-Dakahlyia are fully described in author name. On the ground that had been restored in Egypt's northern Nile Valley, author name did studies on the weed flora. El-Behira, Kafr ElSheikh, ElDakahlia, and Damietta are the four northern governorates of the Nile Delta where author name did study on the floristic traits of the weed flora. The interactions between plant communities and their surroundings were evaluated using multivariate analysis approaches of vegetation that contain the classification and ordination program [34]. Similar to how floristic structures vary by place, they are crucial for the identification and classification of various plant species, as well as for the production of food, shelter, and medicine, as well as for all living things [30]. The definition and study of floristic characteristics and vegetation types in terms of species composition, habitat categorization, and plant diversity are the primary goals of the current effort.

2. Materials and Methods

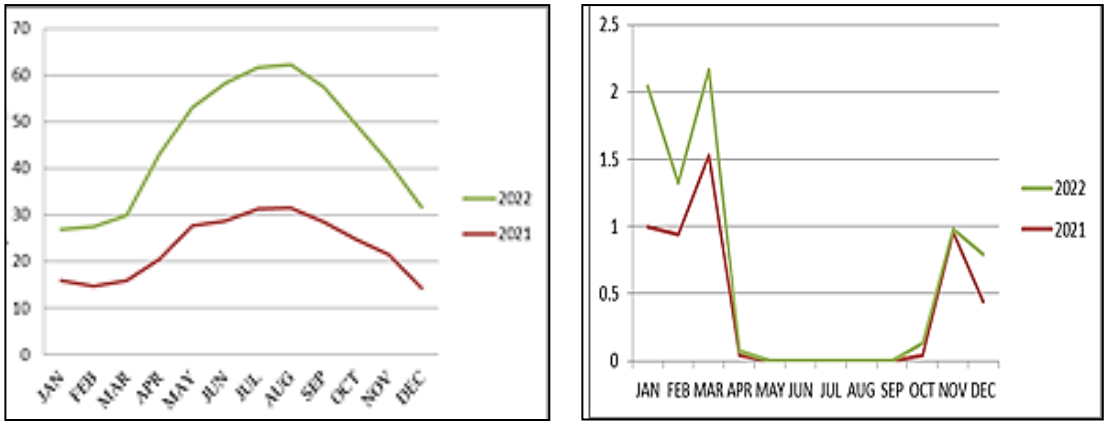
The study orchard was surveyed during the course of the winter and summer of 2021–2022. 169 stands (85 in the winter and 84 in the summer) were selected to conduct research on the weed flora of the study area. Stands were selected to represent the various crops growing in the study area. The arrangement of stands along the middle of Belbeis controlled the size of the farmed land there. Four quadrates (5 m x 5 m for each) were stored on each stand. The GPS coordinates of each stand were recorded. Each stand's occurrence or absence of each species has been recorded. All plant species found in each stand were thoroughly identified before being catalogued [31] and Boulos [8-12]. Voucher herbarium specimens were added to the collection of the Department of Botany and Microbiology at Faculty of Science, Al-Azhar University. According to author name, categories of life forms were determined. Variation in the types of life in the field was not taken into account. Following the system of author name, each species' phytogeographical affinity was ascertained [1] and [2].



(Figure 1) Location map displaying 169 selected stands in both the winter and summer, as well as the Belbeis Center of the El-Sharkia Governorate.

Study area

Between the latitudes of 11 11, 26 34, and 30, Bilbeis is situated. The northern portion of the Nile Delta belonged to the arid region climatologically, whilst the southern portion belonged to the hyperarid region. The minimum and maximum air temperatures were 5.62 °C and 20.2 °C during winter season, respectively. There was a range in the relative humidity of 39.9% to 71%. The annual rainfall varied from 0.33 mm/year in the north to 1.53 millimeters per year in the south [13].



A B

(Figure 2.) Mean average. A. Temperature, B. Rainfall.

3. Results

3.1 Floristic evaluation

124 species from 29 families, 80 genera, and 169 sectors were related. In the various habitats in the study region, 88 species, including annuals, 33 perennials, and 3 biannuals, were connected to the studied families. With 33 species connected to 20 genera, the Poaceae (Gramineae) family, which made up 27.2% of all families (Fig. 3 and Table 1), was the most prevalent. Brassicaceae (13 species = 10.4%), Asteraceae (9 = 7.2%), and Amaranthaceous (16 species = 12.9%) are the next two largest families. There are eight types that cover the Euphorbiaceae and Fabaceae families. There were five species of Caryophyllaceae. Three species of plant Agnaceae, Cyperaceae, and Convolvulaceae families. Additionally, only one species was present in 15 of the study area's families. Additionally, the genera Chenopodium and Euphorbia had the most involvement (7 species each), followed by the genus *Amaranthus*, which has 6 species (4.8% of the total) (Table 1). The reported weed flora can be divided into three groups, as follows, based on life span: 33 perennials (27.31%), three biannuals (2.41%), and 88 species, or 70.16% of the total, are annuals.

Table 1: "Recorded plant species along with their families, lifespans, and chorotypes."

Family	Species	Life form	Floristic categories
Aizoaceae	*Aizoon canariensis* L.	Th	SA-SI. S-Z
Amaranthaceae	*Amaranthus lividus* L.	Th	ME, IR-TR
	A. albus L.	Th	COSM
	A.blitoides S.Watson	Th	COSM
	A.viridis L.	Th	COSM
	A.caudatus L.	Th	COSM
	A.graecizans L.	Th	COSM
	Beta vulgaris L.	Th	ME,IR-TR,ER,SR
	Salsola schweinfurthii Solms	Ch	SA-AR
	Chenopodium ambrosioides L.	Th	COSM
	C. album L.	Th	COSM
	C. ficifolium Sm.	Th	ME,ER-SR
	C. glaucum L.	Th	ME, ER-SR
	C. murale L.	Th	ER-SR,IR-TR,SA-SI
	C. opulifolium Schrad. ExKoch and Ziz	Th	ME,IR-TR,ER-SR,PAL
	C. vulvaria L.	Th	ME,IR-TR
	Atriplex halimus L.	Ch	ME,SA-AR
Apiaceae	*Daucus litoralis* Sm.	Th	ME
	Bupleurum semicompozitum L.	Th	SA-AR
Arecaceae	*Phoenix dactylifera* L.	Ph	SA– SI ,S–Z
Astraceae	*Bidens piloza* L.	Th	PAN
	Conyza Canadensis (L.)	Th	ME
	Conyza bonariensis (L.)	Th	NEO
	Silybum marianum (L.)Gaertn	Ch	ME,IR-TR,ER-SR
	Launaea nudicaulis (L.) Hook.f.	Th	SA-AR
	Pseudognaphalium lutealbum L.	Th	ME,SA-SI,IR-TR

Family	Species	Life form	Floristic categories
	Sonchus giganteus Shuttlew. ex Rouy	Th	COSM
	Sonchus oleraceus L.	Th	COSM
	Xanthium spinosum L.	Th	PAL
Boraginaceae	*Trichodesma africanum* (L.) Lehm.	Ch	SA,SZ
Brassicaceae	*Capsella bura- partosis* (L.)	Th	COSM
	Coronopus niloticus (Delile) Spreng.	Th	S-Z,EGYPT
	C. squamatus C. squamatus(Forssk.)	Th	ME,IR–TR,ER–SR
	C. didymus (l.) Sm.	Th	COSM
	Enarthrocarpus strangulatus Bioss	Th	SA-SI
	E. lyratus (Forssk.)	Th	SA-SI
	Eruca sativa Miller	Th	ME,IR–TR,ER–SR,SA–SI
	Rorippa palustris (L.) Besser	Th	ER-SR,IR-TR,ME
	Raphanus raphanistrum L.	Th	ME,ER-SR
	Rostraria cristata (L.) Tzvelev	Th	COSM
	Sisymbrium irio L.	Th	PAL
	Zilla spinose (L.) Prantl	Ch	SA-SI
Convolvulaceae	*Convolvulus arvensis* L.	Cr	PAL
	Ipomoea eriocarpa R. Br.	Th	PAL
	I. carnea L.	Ph	ME,IR-TR
Cannaceae	*Canna indica* L.	Cr	COSM
Caryophyllaceae	*Spergularia bocconii* Sol.exsched	Th	ME,IR-TR,ER-SR
	Stellaria pallida (Dumort.) Murb.	Th	ME,ER-SR
	Spergularia marina (L.) Griseb	Th	ME,IR-TR,ER-SR
	S. rubra (L.)J&C.persl	Th	COSM
	Silene aegyptiaca (L.) L.f.	Th	ME
Cucurbitaceae	*Citrullus colocynthis* (L.) Schrad.	Hem	ME,SA-SI,IR-TR,S-Z
Cyperaceae	*Cyperus articulates* L.	Cr	PAN
	C. difformis L.	Th	PAL
	C.rotundus L.	Cr	PAN
Euphorbiaceae	*Euphoebia acalyphoides* Hochst. Ex Boiss.	Ch	ME,IR-TR,S-Z
	E. hirta L.	Th	COSM
	E. granulata Forssk.	Th	PAL,NEO
	E.helioscopia L.	Th	COSM
	E.heterophylla L.	Th	PAN
	E.peplus L.	Th	COSM
	E.prostrata Aiton	Th	PAN
	Ricinus communis L.	Ph	CULT and NAT
Fabaceae	*Alhagi graecorum* Boois.	Ch	PAL
	Lotus hebranicus Brand	Per	SA-AR
	Melilotus indicus (L.)All	Th	ME,IR-TR,SA-SR
	M. sulcatus Desf.	Th	ME
	M.albus Medic	Th	ME,SA+IR-TR
	Vicia sativa (L.)	Th	ME,SA-SI
	Medicago intertexta(L.)Mill.	Th	ME,ER-SR
	Trifolium resupinatum L.	Th	ME,SA-SI
Tiliaceae	*Corchorus olitorius* L.	Th	COSM
Lamiaceae	*Lamium amplexicaule* L.	Th	ME,SA-SI
Fumariaceae	*Fumaria densiflora* DC.	Th	ME,SA-SI
Loranthaceae	*Emex spinosa (L.)* Campd.	Th	ME,SA-SI
Malvaceae	*Malva palviiflora* L.	Th	ME,ER-SR
Orobanchaceae	*Orobanche ramoza* L.	Ch	ME,IR-TR
Oxalidaceae	*Oxalis cernua* var. namaquana Sond.	Th	COSM
	O. corniculata L.	Th	COSM
Plantaginaceae	*Plantago major* L.	Hem	COSM
Scrophulariaceae	*Veronica anagallis-aquatica* L.	Ch	COSM
	V. polita	Th	ME,IR-TR,ER-SR
Poaceae	*Agrostis stolonifera* L.	Cr	ME,IR-TR
	Avena fatua L.	Th	PAL

Family	Species	Life form	Floristic categories
	A. sativa L.	Th	COSM
	A. sterilis L.	Th	COSM
	Bracharia reptans(L.)	Th	PAL.
	B. eruciformis(Sibth.)&Sm.)Griseb	Th	ME,IR-TR
	Bromus catharticus Vahl.	Th	ME,IR-TR , ER-SR
	B. diandrus Roth.	Th	ME,IR-TR
	Cenchrus echinatus L.	Th	NEO
	Cynodon Dactylon (L.) Pers	Cr	COSM
	Dactyloctenium aegyptium (L.)	Th	PAL
	Digitaria sanguinalis (L.)	Th	PAL
	D. retroflexa (Vahl) Penz.	Th	PAL
	Echinochloa colona (L.) Link	Th	ME, IR-TR.PAL
	Lolium perenne L.	Cr	ME, IR-TR,ER-SR
	Paspalidium geminatum (Forssk.) Stapf	Cr	PAL
	Pennisetum divisum (Forssk.exJ.F.Gmel.)Henrard	Cr	SA-AR
	P. setaceum (Forssk.) Chiov.	Cr	PAL
	Poa annua L.	Th	ME, IR-TR, ER-SR
	Polypgon mopeliensis (L.) Desf.	Th	COSM
	P. semivesticillatus(Forsk)	Cr	ME
	P. viridis (Gouan) Breistr.	Th	COSM
	Setria vertillata P.Beauv.	Th	COSM
	Sorghum arundinaceum (Desv.) Stapf	Th	PAL
	S. halepense (L.) Pers	Ch	PAL
	S. bicolor (L.) Moench	Th	PAL
	Phalaris paradoxa L.	Th	ME, IR-TR
	Panicum coloratum L.	Cr	ME
	P.repens L.	Cr	PAL, NEO+ME
	P.turgidum Forssk.	Cr	SA-SI
	Phalaris canariensis L.	Th	PAN
	P. paradoxa L.	Th	PAN
	*Phragmites australis (*Cav.)Trin.exsteud	Cr	PAL
Polygonaceae	*Persicaria salcifolia* (Brouss. ex Willd.) Assenov	Ch	PAL
	Polygonum equisetiforme Sm.	Ch	ME, IR-TR
Prmulaceae	*Anagallis arvensis* L.	Th	COSM
Rosaceae	*Rosa canina* L.	Ch	COSM
Solanaceae	*Solanum nigrum* L.	Th	COSM
Urtiaceae	*Urtica urens* L.	Th	ME, IR-TR,ER-SR
Verbenaceae	*Lippia nodiflora* (L.) Michx.	Ch	PAN

Ph= Phanerophytes; Ch= Chamaephytes; Cr= Cryptopyte, He= Hemicryptophyte and Th= Therophytes. The Chorotypes types are: COSM= Cosmopolitan, IT= Irano-Turanian, ME= Mediterranean, SA= Saharo-Arabian,SZ=Sudano-Zambezian, TR= Tropical, PAN= Panatropical, PAL= Palaeotropical, Cult= cultivated, IR= Irano-Turanian , ER- SR =Euro-Siberian, NEO, Neotropical. Life span is: Ann= Annuals, Per= perennials and Biann= Biannuals.

3.2 Life span

Therophytes, which comprised 89 species and made up 71.77% of all species, was the highest life form identified. According to Table 1, Cryptophytes occupied in second place with 13 species, accounting for 10.48% of all species. Similar to this, it was determined that 10 different chaemophyte species accounted for 8.06% of the total. There were nine further species of cryptophytes. Three other species, *Canna indica*, *Phoenix dactylifera, and Ricinus communis,* were seen as phanerophytes (Figure 4).

3.3 Chorology

The species that had been detected in the various area research of the Nile valley may be classified as monoregional, biregional, or pleuregional based on the temporal analysis (Table 2 and Fig. 5). It was noticed that predominance of global species over local taxa in just one, a few, or even two sites. A total of 31 species, or 25% of all species, were found in the cosmopolitan elements. Mediterranean species accounted for the biggest proportion (5.64%) in the Monoregonal zone, with 7 species. The Mediterranean, which is shared with Irano-Turanian, and the tropical zone, with 11 species (8.87%), both made up the biggest percentage in the biregional area. On the other hand, the Mediterranean region shared 13 species (10.48%) with Irano-Turanian whereas the tropical regions shared with the Euro-Siberian. The pleuregional components contained 54 species (36.51% of the total number of species detected). These groupings additionally showed the preponderance of Mediterranean elements. The second-

highest quantity of components were contributed by the palaeotropical region to the study area. The pleuriregional (Mediterranean, Irano-Turanian, Euro-Siberian, and tropical) region contained just 13 species, or 10.48% of all species. Commercial *Ricinus* communis cultivation only involves one species. 84 'new' species were found that were not mentioned in the most current review of the study region by author name thanks to this examination.

4. Discussion

Activities such as urban encroachments on agricultural lands, and excessive use of chemical fertilizers and pesticides have severely affected the agro-ecosystems of the Nile Wadi and Delta. Effects have dramatically altered physical, chemical and biological components of these ecosystems. Several studies have investigated the effects of agricultural practices on the biotic and abiotic components of agroecosystems and consequently on the weed flora. Weed composition in response to these changes has also changed in adaptation to these new conditions [35]. They also mentioned that more resistive species may have replaced sensitive weeds in response to the excessive use of chemicals and the inappropriate methods implemented to eliminate weeds. A system comprising many species in varied habitats that are influenced by ecological conditions makes up the weed community. According to the present study Belbeis Center survey, there were 124 taxa total among the wild plant species, which are divided into 80 genera and 29 families. Our study of flowers supported their findings. According to author name the floristic structure, the bulk of the wild plants in this area (25%) was Poaceae, which is compatible with other conclusions [29] based on their investigation in the same field. The Poaceae's abundance may be attributed to soil changes, water fluctuation caused by yearly precipitation, and soil changes that show this family's suitability for the environment. Our findings showed that the major families with the highest percentages of total species were Poacaea, Brassicaceae, Asteraceae, and Amaranthacaeae. This suggests that the common taxa, which made up the majority of the flora in the study area, were these five families. The Mediterranean climate was known to as a "therophyte climate" due to the significant proportion of this period in the bulk of Mediterranean floras. Therophytes are the major contributors, indicating that the vegetation has been modified to account for the water balance.

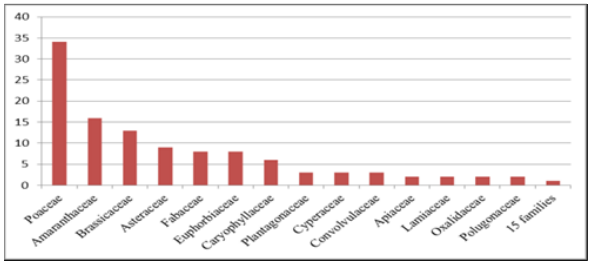
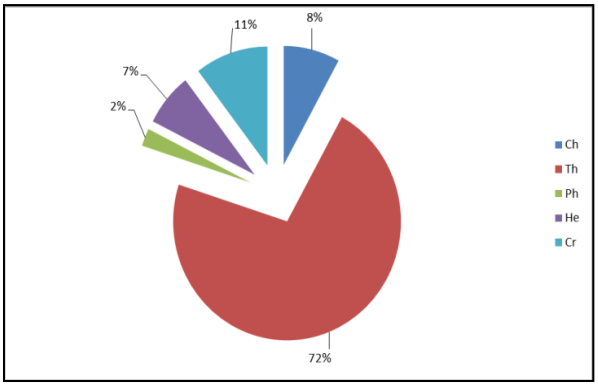


Figure 3. Floristic composition of families in the Belbies center



(Figure 4) Examination of Bilbies Center's biological forms.

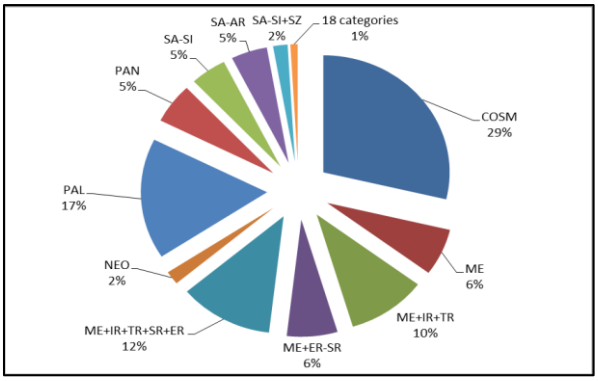


Figure 5. Distribution of floral categories in the Belbies' center

Table 2. The species' distribution of phytochromes

Phytochoria	Species No.	Percentage
COSM	31	25.0
PAL	18	14.51
PAN	9	4.83
NEO	3	1.61
Monoregional		
ME	7	5.64
SA-SI	5	4.03
SA-AR	5	4.03
S-Z	1	0.80
Biregionals		
ME, IR-TR	12	8.87
ME, ER-SR	7	5.64
SA-SI,S-Z	2	4.03
PAL, NEO	1	0.80
S-Z, EGYPT	1	0.80
Pleuregional		
ME, IR-TR,ER-SR	15	10.48
PAL, NEO,ME	1	0.80
ME, IR-TR, ER-SR	1	0.80
ME, IR-TR ,S-Z	1	0.80
ME, IR-TR, PAL	1	0.80
ME, IR-TR, ER-SR, SZ	1	0.80
ME, IR-TR, ER-SR, SA-SI	1	0.80
ME+ER-SR+ SA-SI+SZ	1	0.80

These findings are consistent with those of [20], [25], [29] [30]. (either write the author names or cancel These findings are consistent with those of) In order to analyze the structure of the plant in relation to environmental changes, life spans are essential [24]. Because of therophytes' dominance, vegetation persists and may even grow vigorously [21]. Because of their shorter life cycles and ability to withstand the instability of the agricultural system, therophytes have a dominant position among weed vegetation. Therophytes' supremacy also brought about substantial changes in the climate, such as a propensity for dry, hot weather and animals' involvement [3]. This astonishing diversity was brought about by the numerous rainfall sources and the rich soil.

The ecological and floristic characteristics of the three ecosystems in El-Dakahlyia Province are comprehensively outlined in author name. During his investigation, he noted roughly 200 species from 48 families. The cosmopolitan elements showed a higher percentage of weeds from phytogeographically distinct regions than the other two regions these findings are similar with [23], [6], [16], [17], and [27]. This behavior might be caused by the Mediterranean species' propensity towards milder components. The present research demonstrates how badly the monoregional Mediterranean element performs when compared to biregional and pluriregional components, as reported by [15] and [33]. There is a definite difference in the number of weeds between the current study and the previous floristic investigations on the central part of Belbies. The present study survey included 84 'new' species that had not been identified in the area's earlier examination [15]. The increased number of spontaneous species that had been found in the study area may be partially explained by the study's higher research potentials. This rise is most likely connected to trends in agricultural intensification.

Conclusion

124 species belonging to 80 genera and 29 families were recorded in 169 sectors of Belbies Center in Al-Sharkia Governorate. In study region, 88 species, including annuals, 33 perennials, and 3 biannuals, were recorded in different sectors, the Poaceae (Gramineae) family, which made up 27.2% of all families. Brassicaceae (13 species = 10.4%), Asteraceae (9 species), and Amaranthaceous (16 species) are the next two largest families. Therophytes (87 species and accounted for 70.61%) of the recorded species were the dominant life form. Additionally, chorological analysis showed that a cosmopolitan species having a 31 species (25% of all species) are predominant. The monoregional area, where those elements make up accounted for 31 species in total (25% of all species). In this investigation, 84 new species that had not been recorded before in the same area were illustrated.

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