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Ecological Characterization of Halophytic Vegetation in Sabkha Saban, Libya: Life Forms and Chorological Patterns

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ABSTRACT

This study investigates the floristic composition, life-form spectra, and chorotypes of the vegetation cover in Sabkha Saban and its surrounding environments in Libya. Plant specimens were collected during ten bimonthly field surveys conducted from January to May 2023, covering various microhabitats within the study area. A total of 48 plant species, belonging to 47 genera and 21 families, were identified. The Asteraceae family exhibited the highest species richness (20.8%), followed by Poaceae (14.58%), Brassicaceae (8.33%), Chenopodiaceae (8.33%), and Fabaceae (6.25%).Analysis of life forms revealed a clear dominance of therophytes (29 species; 60.41%), followed by hemicryptophytes (11 species; 22.91%), reflecting the seasonal nature of the saline environment. From a phytogeographical perspective, Mediterranean elements were most prevalent, with 14 species (29.16%) classified as Mediterranean chorotypes. Other significant distributions included Mediterranean-Irano-Turanian (12.5%) and Euro-Siberian-Mediterranean (12.5%) links. Comparative analysis with Floristic and inventory study of Mallaha Wetland Tripoli-Libya. —specifically—revealed 23 shared species and 25 unique records identified in this study. These findings provide critical baseline data for the conservation of halophytic biodiversity in arid and semi-arid saline ecosystems, underscoring the ecological value of Sabkha Saban.

التوصيف البيئي للغطاء النباتي الملح في سبخة سبان، ليبيا: أشكال الحياة والأنماط التوزيعية

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تتقصى هذه الدراسة التركيب الفلوري (النباتي)، وأطياف أشكال الحياة، والأنماط التوزيعية (Chorotypes) للغطاء النباتي في "سبخة صبان" والبيئات المحيطة بها في ليبيا. جُمعت العينات النباتية خلال عشر مسوحات ميدانية أجريت مرتين شهرياً في الفترة من يناير إلى مايو 2023، غطت مختلف البيئات الدقيقة (Microhabitats) داخل منطقة الدراسة. تم تحديد ما مجموعه 48 نوعاً نباتياً، تنتمي إلى 47 جنساً و21 فصيلة. سجلت الفصيلة النجمية (Asteraceae) أعلى تنوع للأنواع بنسبة (20.8%)، تليها الفصيلة النجيلية (Poaceae) بنسبة (14.58%)، ثم الفصيلة الصليبية (Brassicaceae) بنسبة (8.33%)، والفصيلة القطيفية (Chenopodiaceae) بنسبة (8.33%)، والفصيلة البقولية (Fabaceae) بنسبة (6.25%) . وكشف تحليل أشكال الحياة عن سيطرة واضحة للنباتات الحولية (Therophytes) بواقع (29 نوعاً؛ 60.41%)، تليها النباتات نصفيّة المختبئة (Hemicryptophytes) بواقع (11 نوعاً؛ 22.91%)، مما يعكس الطبيعة الموسمية للبيئة الملحية. ومن منظور الجغرافيا النباتية، كانت عناصر حوض البحر المتوسط هي الأكثر انتشاراً، حيث صُنفت 14 نوعاً (29.16%) ضمن الأنماط التوزيعية المتوسطية. وشملت التوزيعات الهامة الأخرى الروابط المتوسطية–الإيرانية–الطورانية (12.5%)، والروابط الأوروبية–السيبيرية–المتوسطية.(12.5%) . أظهر التحليل المقارن مع الدراسات السابقة حول الأراضي الرطبة الليبية — وتحديداً دراسة مخلوف والصغير (2016)، وجود 23 نوعاً مشتركاً و25 تسجيلاً فريداً تم تحديدها في هذه الدراسة. توفر هذه النتائج بيانات مرجعية حاسمة لصون التنوع البيولوجي للنباتات الملحية في النظم البيئية الملحية القاحلة وشبه القاحلة، مما يؤكد على القيمة البيئية لسبخة صبان.

INTRODUCTION

Biodiversity, or biological diversity, encompasses the vast array of life forms on Earth, the diversity of ecosystems, and the intricate processes that sustain life (Okasha, 2010). It is a fundamental component of resilient living systems, ensuring stability and functional integrity. Consequently, there has been a growing interest in studying the biological diversity of the Libyan flora. A significant initiative between 1976 and 1986 led to the compilation of the Encyclopedia of Libyan Flora. El-Gadia & Jaffri (1989) subsequently reviewed and revised previous studies, cataloging 150 plant species. Further research on Mediterranean coastal vegetation in the Green Mountain, Libya, identified 179 plant species (Al-Jaroushi& Al-Madham, 2015).

Flora studies are fundamentally taxonomic investigations aimed at cataloging plant species within specific geographical or political boundaries (Al-sahir, 1987). Saline environments are characterized by a unique vegetation cover dominated by highly specialized plants known as halophytes. These plants exhibit remarkable tolerance to high soil salinity and, in some cases, extreme atmospheric temperatures, thriving in conditions where non-saline plants (glycophytes) cannot survive (Zahran, 1995).

Salt marshes are wetlands where vegetation predominantly consists of short shrubs or grasses. These sabkhas are typically found in low-lying coastal areas that are often inundated with water, particularly during winter. Seawater ingress through sand dunes and waterways leads to the sabkha, where it remains until spring, evaporating and depositing salt (Adam, 1990). The present study focuses on the plants growing in Sabkha Saban and its adjacent areas.

The primary importance of this study lies in systematically identifying and classifying the halophytic flora within Sabkha Saban and its surrounding environment. Furthermore, it aims to highlight the potential economic and medicinal value of many of these species for human and animal welfare. Such unique environments are often overlooked and are increasingly susceptible to anthropogenic pressures, including overpopulation and overgrazing, making their ecological characterization vital for conservation efforts.

STUDY AREA:

The study was conducted in Sabkha Saban, a saline wetland stretching approximately 2 linear kilometers along the Coastal Road to the northern ancient wall (32°54'15.4"N, 13°17'57.4"E). To the east, the study area extends 205 meters to Span Roundabout (32°53'44.4"N, 13°19'24.8"E), and to the west, it reaches the sparkling road, covering a distance of 2 kilometres (32°53'53.8"N, 13°18'36.0"E), encompassing the southern old wall. From Saban Roundabout southwards, the study area includes the Saban Market Road, extending approximately one kilometre (32°53'32.8"N, 13°19'31.5"E) to February 25 Roundabout, a distance of 173 meters (32°53'32.8"N, 13°19'31.5"E).

The study area is characterized by a flat, fertile terrain with significant salt deposits on its surface. This unique environment has fostered the adaptation of specialized natural plant communities. The region experiences a Mediterranean climate, characterized by dry summers and relatively humid winters (Al-Hajaji, 1989).

Sebkha Saban (known locally or in some sources as sebkha Saban or navigation) located near one of the coasts of the city of Tripoli, one of the important wetlands on the Libyan coast. Here is the ecological profile of this unique biosystem: Physical and geographical characteristics Location: located near one of the Libyan coasts, it is a shallow coastal depression separated from the sea by a sandy or rocky barrier. Composition: the Sabkha feeds from sea water through filtration (Seepage) during storms, in addition to rainwater and torrents descending from nearby heights. Salinity: it is characterized by a high fluctuation in salinity levels; it is flooded with water in winter and spring, while it turns into dry, scaly salt flats in summer as a result of intense evaporation.

Figure 1. Satellite Imagery Showing the Location of Botanical Sampling Sites in Sabkha Saban, Libya

Coastal sabkhas are not merely "salt flats"; they are vital, high-functioning ecosystems. Integrating the following points will highlight why Sabkha Saban is a priority for conservation:

Unique Flora (Halophytes): These areas host specialized plant species capable of thriving in high salinity. These plants are genetic reservoirs for salt-tolerance research, which is crucial for future food security in arid regions.

Avian Waystations: Sabkhas often serve as critical stopover points for migratory birds traversing the Mediterranean, providing essential feeding and nesting grounds.

Carbon Sequestration: Coastal wetlands are powerful carbon sinks, playing a disproportionately large role in climate regulation relative to their size.

Hydrological Balance: They act as natural buffers against coastal flooding and help manage the groundwater salinity levels of the surrounding fertile plains.

MATERIALS AND METHODS

Plant samples were collected during the active growing and flowering season, from January to May 2023. A total of ten field trips were conducted, with two trips per month, The samples were collected randomly from the lowlands, as well as from the Highlands and the seashore. to ensure comprehensive sampling across the study area (specifically from the back wall of Mitiga, the Coastal Road, Span Island, and extending to Island 25). During each trip.The samples were collected randomly, as in the case of Mahklouf& Al-Sghair (2016) were collected as completely as possible to facilitate accurate description and identification.Collected samples were subjected to standard herbarium procedures, including pressing, drying, mounting, and subsequent identification. A data card was developed for each plant sample to record relevant information. Plant identification

and classification were primarily based on the Encyclopaedia of Libyan Flora and the taxonomic keys available at the herbarium of the Department of Biology, Faculty of Education, Tripoli University.

RESULTS AND DISCUSSION

A floristic survey of Sabkha Saban and its surrounding environments identified a total of 48 plant species, distributed across 47 genera and 21 families. The taxonomic diversity is characterized by a high concentration of species within a few dominant groups, as detailed below:

Family Distribution and Dominance

- Asteraceae: The most dominant family, represented by 10 species (20.8%) across 10 distinct genera.
- Poaceae: The second most prevalent group, comprising 7 species (14.58%) from 6 genera.
- Brassicaceae & Chenopodiaceae: Each family contributed 4 species, accounting for 8.33% of the total flora each.
- Fabaceae: Represented by 3 species (6.25%) from 3 genera.

Table 1. Taxonomic Diversity and Proportional Representation of Plant Families

Family	Number of species	The percentage
Asteraceae	10	%20.8
Poaceae	7	%14.58
Brassicaceae	4	%8.33
Chenopodiaceae	4	%8.33
Fabaceae	3	%6.25
Apiaceae	2	%4.16
Aizoaceae	2	%4.16
Boraginaceae	2	%4.16
Plantaginaceae	2	%4.16
Liliaceae	1	%2.08
Caryophyllaceae	1	%2.08
Convolvulaceae	1	%2.08
Euphorbiaceae	1	%2.08
Geraniaceae	1	%2.08
Illecebraceae	1	%2.08
Malvaceae	1	%2.08
Mimoaceae	1	%2.08
Polygonaceae	1	%2.08
Scrophulariaceae	1	%2.08
Solanaceae	1	%2.08
Tetragoniaceae	1	%2.08

Life Form Analysis

The life form classification, following Raunkiaer's system (indicated by abbreviations such as 'ph' for Phanerophyte, 'G' for Geophyte, 'Th' for Therophyte, 'H' for Hemicryptophyte, 'NP' for Nanophanerophyte, and 'CH' for Chamaephyte), reveals a clear dominance of Therophytes (Th). A significant proportion of the recorded species, such as *Bromus rigidus*, *Catapodium rigidum*, *Aizoon hispanicum*, and many within the Asteraceae, Brassicaceae, and Chenopodiaceae families, are annuals that complete their life cycle within a single growing season. This high prevalence of therophytes is a characteristic adaptation to environments with distinct dry and wet seasons, such as those found in Mediterranean climates. These species often possess rapid growth rates and prolific seed production, enabling them to exploit favourable conditions and survive extended periods of drought as dormant seeds.

Other prominent life forms include Hemicryptophytes (H), exemplified by Hordeum vulgare, Artemisia campestris, and Plantago lagopus. Hemicryptophytes protect their perennating buds at ground level, offering resilience against adverse environmental conditions like grazing or fire. Phanerophytes (ph) and Nanophanerophytes (NP), such as Drimia maritina (L) Stearn, Ricinus communis, and Acacia cyanophylla, represent woody plants. Their presence, albeit less frequent than therophytes, indicates areas with more stable conditions or specific microhabitats that support woody growth. Geophytes (G), like Arundo donax, survive unfavourable periods as underground storage organs, while Chamaephytes (CH), represented by Polygonum equisetiforme, maintain their perennating buds close to the ground on erect or prostrate shoots. The overall life form spectrum provides crucial insights into the ecosystem's resilience and its adaptive strategies to the local climate.

Chorotype Analysis and Biogeographical Implications:

The chorotype classification reveals the geographical distribution patterns of the species, offering insights into the biogeographical origins and historical connections of the flora. As noted previously, the Mediterranean (Med.) chorotype is highly dominant, encompassing species such as *Drimia maritime* (L) Stearm, *Catapodiumrigidum*, *Aizoon hispanicum*, and numerous others. This strong Mediterranean affinity underscores the study area's location within or under the significant influence of the Mediterranean Basin's unique climate and vegetation.

Several species exhibit broader distribution patterns, indicating shared floristic elements with adjacent bi-geographical regions. For instance, the Mediterranean/Irano-Turanian (Med./Ir-Tur.) chorotype (e.g., Arundo donax, Hordeum marinum, *Carthamus lanatus*)and the Mediterranean/Euro-Siberian (Med./Eur-Si.) chorotype (e.g., *Bromus rigidus*, *Mesembryanthemum crystallinum*, *Artemisia campestris*) are well-represented. These combined chorotypes highlight the transitional nature of the flora, reflecting influences from arid Irano-Turanian steppes to the east and temperate Euro-Siberian regions to the north.

The presence of species with Saharo-Arabian (Sah-Ara) chorotypes, such as *Reichardia tingitana*, *Hussonia pinnat*, and *Retama raetum*, suggests an influence from

desert and semi-desert regions, indicating the proximity of xeric environments or a capacity of these species to colonize drier habitats within the study area. Cosmopolitan (Cos) and Pluriregional (Plu) species (e.g., Conyza bonariensis, *Heliotropium carassavicum*, *Anethum graveolens*, *Spergularia bocconei*, *Chenopodium album*, *Nicotiana glauca*) denote species with very wide distributions, often associated with human disturbance or high ecological plasticity. Finally, the inclusion of species "Cultivated throughout the world" (*Hordeum vulgare*, *Triticum aestivum*) and those originating from "Americas" (*Conyza bonariensis*) or "Australia" (*Acacia cyanophylla*) points to anthropogenic influences and the introduction of non-native species, which can significantly alter local floristic composition and ecosystem dynamics. The detailed chorological data in Table 2 thus provides a foundation for understanding the biogeographical history and current ecological status of the study area's plant communities.

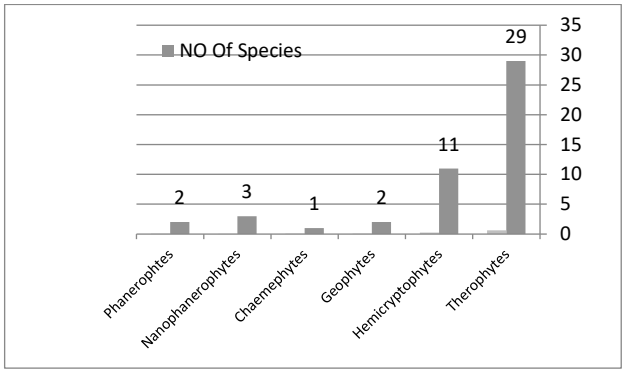

Figure 2. Distribution and Percentage of Life Forms Recorded at the Study Sites

Table 2. Floristic Inventory, Life Forms, and Chorotypes of the Study Area.

No	Family	Species	Life Form	Chorotype
1	Liliaceae	*Drimia maritima* (L) Stearn	ph	Med.
2	Poaceae	*Arundo donax* L.	G	Med/ Ir-Tur.
3		*Bromus rigidus* Roth	TH	Med/ Eur-Si.
4		*Catapodium rigidum* (L) C.E. Hubbard	TH	Med.
5		*Cynodon dactylon* (l) Pers.	G	Trop.
6		*Hordeum marinum* Huds.	TH	Med/ Ir-Tur.
7		*Hordeum vulgare* l.	TH	Cultivated throughout the World.
8		*Triticum aestivum* L	H	Ir-Tur/ Cultivated throughout the World.
9	Aizoaceae	*Aizoon hispanicum* L	TH	Med
10		*Mesembryanthmeum crystallinum* L	TH	Med/ Eur-Si.
11	Apiaceae	*Anethum graveolens* L.	TH	Plu.
12		*Daucus capillifolius* Gilli.	TH	Med.
13	Asteraceae	*Anacyclus monanthos* (l) Thell.	TH	Med.
14		*Artemisia campestris* L	H	Med/ Eru- Si
15		*Caradus argentatus* L.	TH	E- Med/ w-Ir-Tur
16		*Carthamus lanatus* L.	TH	Med/ Ir-Tur/Eur-Si.
17		*Centaurea dimorpha* Viv.	H	Med/Ir-Tur.
18		*Conyza bonariensis* L.	TH	Cos/Americas
19		*Echinops spinosissimus* Turra	TH	Med.
20		*Phagnaion rupestre* L.	H	Med/Eur-Si.
21		*Reichardia tingitana* (L) Roth	TH	Sah-Ara/Ir-Tur.
22		*Senecio gallicus* L	TH	Med
23	Boraginaceae	*Echium angustifolium* Mill.	H	Med.
24		*Heliotropium curassavicum* L.	H	Cos.
25	Brassicaceae	*Cakile aegyptica* (L) Willd.	TH	Med/Eur-Si
26		*Enarthro carpusclavatus* Del.Ex. Godr	TH	Med
27		*Hussonia pinnata* (viv) Jafri.	TH	Sah-Ara
28		*Lobularia maritime* (L) Desv.	H	Med
29	Caryophyllaceae	*Spergularia bocconeii* (Scheele) Asch & Graebn	TH	Plu
30	Chenopodiaceae	*Atriplex rosea* L	TH	Med
31		*Beta vulgaris* L.	H	Med/Ir-Tur/Eur-Si.
32		*Chenopodium album* l.	TH	Plu.
33		*Kochia indica* Wight.	TH	Med/Ir-Tur.
34	Convolvulaceae	*Convolvulus althaeoides* L.	TH	Med
35	Euphorbiaceae	*Ricinus communis* L.	NP	Ir-Tur/Sud.
36		*Lotus halophilusBoiss*, et Sprun.	TH	Med
37	Fabaceae	*Lotus cytisoides* L.	H	Med
38		*Retama raetum* (Forsk) Webb.	NP	Sah-Ara

39	Geraniaceae	*Erodium glaucophyllum* (L)Herit.	H	Sah-Ara
40	Illecebraceae	*Paronychia arabica* (Linn.) Dc	TH	Med/Ir-Tur.
41	Malvaceae	*Malva parviflora* L	TH	Med/Eur-Si
42	Mimoscaceae	*Acacia cyanophylla* Lindley	PH	Ir-Tur/Au
43	Plantaginaceae	*Plantago coronopus* L	TH	Med/Ir-Tur
44		*Plantago lagopus* L	TH	Med/It-Tur/Eur-Si
45	Polygonaceae	*Polygonum equisetiforme* Sibth & Sm.	CH	Plu
46	Scrophulariaceae	*Kickxia aegyptiaca* L	H	Med/Sah-Ara.
47	Solanaceae	*Nicotiana glauca* R. C. Graham.	NP	Plu
48	Tetragoniaceae	*Tetragonia tetragonoides* (Pallas) O.kuntz	TH	Sud.

Ch- chamaephytes, G* geophytes, H- hemicryptophytes, Np- nanophanerophytesm, Ph- phanerophytes, TH- therophytes; Cos- cosmopolitan, Med- mediterraneanmPlu- pluri- regional, Sah- Ara- saharo- Arabian, Sud- sudanian, Trop- Tropical. Americas; Ir- Tur/ Au- Irano- Turanian/ Australian; Ir- Tur/ Sud- Irano- Turanian/ Sudanian; Sah-Ara/ Ir- Tur- Saharo- Arabian/Irano- Turanian; Med/ Ir- Tur- Mediterranean/ Irano- Turanian; Med/ -Ir- Tur/ Eru- Si- Mediterranean/ Irano- Turanian/ Euro- Siberian; Med/ Sah-Ara- Mediterranean/ Saharo- Arabian; E- Med/ w- Ir- Tur- Mediterranean- Irano; Cultivated throughout the world.

Floristic analysis, which involved calculating the ratio of each species' presence relative to the total number of collected species, also investigated the geographical distribution patterns (chorotypes) and life forms of the identified species. The dominance of Asteraceae was further confirmed by fluorescence analysis, representing 10 species (20.8%). Poaceae accounted for 7 species (14.58%), while Brassicaceae and Chenopodiaceae each contributed 4 species (8.33%). The remaining results are detailed in Table 1 and Figure 1.

The study of life forms revealed a clear dominance of annual herbaceous plants (therophytes), with 29 species accounting for 60.41% of the total flora. Perennial herbaceous plants (hemicryptophytes) followed with 11 species (22.91%) (Table 3, Figure 2). Geophytes, nanophanerophytes, and phanerophytes comprised smaller proportions (Table 3)

Table 3. Numerical and Percentage Distribution of Life Forms in Sabkha Saban

Life Form	No. of specie	% Of total species
Therophytes	29	%60.41
Hemicryptophytes	11	%22.91
Geophytes	2	%4.16
Chaemephytes	1	%2.08
Nanophanerophytes	3	%6.25
Phanerophtes	2	%4.16

Table 4 presents a quantitative summary of the geographical distribution patterns (chorotypes) of the species identified in the study sites, detailing both the number of species and their respective percentages of the total flora. This table provides crucial insights into the biogeographical affinities and influences shaping the plant community.

Dominance of Mediterranean Elements

Consistent with the individual species data (as discussed in relation to Table 2), the Mediterranean (Med) chorotype emerges as the most dominant, accounting for 14 species, which represents 29.16% of the total flora. This strong representation unequivocally positions the study area within the broader Mediterranean floristic region, characterized by a climate of hot, dry summers and mild, wet winters. This dominance underscores the profound influence of the Mediterranean biogeographical zone on the species composition.

Significant Bi-Regional Influences

Following the pure Mediterranean element, two composite chorotypes show substantial representation:

- Mediterranean/Irano-Turanian (Med/Ir-Tur): With 6 species (12.5%), this group indicates a significant influence from the arid and semi-arid Irano-Turanian region to the east. This suggests either a transitional zone or the presence of specific microhabitats within the study area that can support species adapted to more continental and xeric conditions.
- Mediterranean/Euro-Siberian (Med/Eur-Si): Also with 6 species (12.5%), this chorotype highlights connections with the temperate Euro-Siberian region. These species might be found in cooler, more mesic microclimates or represent wider-ranging species that extend into the Mediterranean zone from the north.

The co-dominance of these two bi-regional patterns (Med/Ir-Tur and Med/Eur-Si) alongside the pure Mediterranean element suggests that the study area is a floristic crossroads, influenced by different major biogeographical realms.

Other Notable Contributions

Pluriregional (Plu) species constitute 5 species (10.41%), indicating a notable presence of widely distributed taxa, often associated with human disturbance or high ecological adaptability. The Saharo-Arabian (Sah-Ara) chorotype, with 3 species (6.25%), signifies an influence from desert and semi-desert regions, pointing to a xeric component within the local flora or the ability of these species to colonize drier niches.

Several other chorotypes are represented by a single species each (2.08% for each category), including:

- Mediterranean/Irano-Turanian/Euro-Siberian (Med/Ir-Tur/Eur-Si): This broad category further emphasizes the area's transitional nature.
- More specific combinations like Med/Sah-Ara, Sah-Ara/Ir-Tur, Ir-Tur/Sud, Ir-Tur/Au, and E. Med/w. Ir-Tur highlight the fine-scale biogeographical complexities and the unique origins of individual species.
- The presence of Tropical (Trop), Sudanese (Sud), and Cosmopolitan/Americas (Cos/Americas), Cosmopolitan (Cos), and "Cultivated throughout the World" categories, along with "Ir-Tur/Cultivated throughout the World," reflects both natural long-distance dispersal patterns (e.g., tropical elements at their northern limit) and, significantly, the impact of anthropogenic activities and the introduction of non-native species.

The chorological spectrum presented in Table 4 robustly supports the characterization of the study area's flora as primarily Mediterranean, but with significant floristic exchanges and influences from Irano-Turanian and Euro-Siberian regions, alongside a discernible Saharo-Arabian component. The diversity of chorotypes, including a number of widespread and introduced species, underscores the dynamic nature of this plant community and its susceptibility to both natural environmental gradients and human-mediated dispersal.

Table 4. Floristic Composition and Chorological Distribution of Species

Chorotype	No of species	% Of total species
Med	14	29.16%
Med/ Ir- Tur	6	12.5%
Med/ Eur- Si	6	12.5%
Plu	5	10.41%
Sah- Ara	3	6.25%
Med/ Ir- Tur/ Eru- Si	3	6.25%
Med/ Sah- Ara	1	2.08%
Sah- Ara/ Ir- Tur	1	2.08
Ir- Tur/ Sud.	1	2.08
Ir- Tur/ Au	1	2.08
E. Med/ w. Ir- Tur	1	2.08
Sud	1	2.08
Trop	1	2.08
Cultivated throughout the World	1	2.08
Ir- Tur/ Cultivated throughout the World	1	2.08
Cos/ Americas	1	2.08
Cos	1	2.08

Our floral sampling efforts within the study area yielded a total of 22 species that concurred with the findings of Mahklouf& Al-Sghair (2016), as detailed in Table 5. Additionally, 24 plant samples were collected in the current study that were not documented in the prior research (Mahklouf& Al-Sghair, 2016), presented in Table 6.A notable divergence from Mahklouf& Al-Sghair (2016) was observed in the dominant plant families. The current study identified the Asteraceae family as having the highest representation, followed by the Poaceae family. This contrasts with Mahklouf& Al-Sghair (2016), who reported the Poaceae family as dominant, succeeded by the Asteraceae family.

This study identified significant floristic commonalities with the Mallaha Wetland, Tripoli-Libya, as documented by Mahklouf& Al-Sghair (2016). A notable portion of the plant samples collected in the current investigation were also present in the species inventory of the aforementioned Mallaha Wetland study. These shared species highlight potential ecological connections or similar environmental conditions between the study areas (Table 5).

Table 5. Shared Plant Species Between the Current Study and Mahklouf& Al-Sghair (2016) in Mallaha Wetland, Tripoli-Libya.

Famiy	Species
Poaceae	*Bromus rigidus* Roth..
	Cynodon dactylon (L) pers.
	Hordeum marinum Huds
Aizoaceae	*Mesembryanthemum crystallinum* L.
Asteraceae	*Cardus argentatus* L.
	Phagnalon rupestre L
	Reichardia tingitana (L) Roth
	Senecio gallicus L
Boraginaceae	*Echium angustifolium* Mill
	Heliotropium carassavicum L
Chenopodiaceae	*Beta vulgaris* L
	Kochia indica Wight
Euphorbiaceae	*Ricinus communis* L
Fabaceae	*Lotus cytisoides*L
	Lotus halophilus Boiss, et Sprun.
	Retama raetum (Forsk) Webb.
Geraniaceae	*Erodium glaucophyllum*(L) L. Herit
Malvaceae	*Malva parviflora* L
Mimosaceae	*Acacia cyanophylla* Lindley
Plantaginaceae	*Plantago coronopus* L
Polygonaceae	*Polygonum equisetiforme* Sibth&Sm
Solanaceae	*Nicotiana glauca* R. C. Graham
Tetragoniaceae	*Tetragonia tetragonoides* (Pallas) O. Kuntz.

A significant finding of the current study is the documentation of plant samples that were not previously recorded in the Mallaha Wetland, Tripoli-Libya, by Mahklouf& Al-Sghair (2016). These novel records contribute to a more comprehensive understanding of the wetland's flora (Table 6).

Table 6. Plant Species Unique to the Current Study, Not Recorded by Mahklouf& Al-Sghair (2016) in Mallaha Wetland, Tripoli-Libya.

Family	Species
Liliaceae	*Drimia maritima* (L) Stearn
Poaceae	*Arundo donax* L
	Catapodium rigidum (L) . C. E. Hubbard
	Hurdeum vulgare L
	Triticum aestivum L
Aizoaceae	*Aizoon hispanicum* L
Apiaceae	*Anethum graveolens* L
	Daucus capillifolius Gilli
Asteraeae	*Anacyclus monanthos* (L) Thell
	Artemisia campestris L
	Carthamus lanatus L
	Centaurea dimorpha Viv
	Conyza bonariensis L
	Echinpos spinosissimus Turra
Brassicaceae	*Cakile aegyptica* (L.) Willd
	Enarthrocarpus clavatus Del Ex. Godr
	Hussonia pinnata (Viv) Jafri.
	Lobularia maritime (L) Desv.
Caryophyllaceae	*Spergularia bocconei* (Scheele) Asch & Graebn
Chenopodiaceae	*Atriplex rosea* L
	Chenopodium album L
Convolvulaceae	*Convolvulus althaeoides* L
Illecebraceae	*Paronychia arabica* (Linn) D C
Plantaginaceae	*Plantago lagopus* L
Scrophulariaceae	*Kickxia aegyptiaca* L

CONCLUSION

This study provides a comprehensive chorological and floristic analysis of the surveyed region, revealing a strong dominance of Mediterranean flora. While acknowledging shared species with the Mallaha Wetland as documented by Mahklouf& Al-Sghair (2016), our research also significantly expands the known floristic records by identifying numerous previously uncollected plant samples. Notably, the current study highlights the Asteraceae family as preeminent, followed by Poaceae, which contrasts with prior findings from the Mallaha Wetland that reported Poaceae as dominant. These findings contribute to a more detailed understanding of the regional plant diversity and underscore the dynamic nature of floristic composition, warranting further investigation into the ecological factors driving these observed patterns.

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