

Studies on the Flora of Libya

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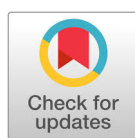
Abstract

Floristic composition, endemic species, new records of species, plant life-forms, medicinal plants and the distribution of plants in Libya were studied. The results show that in Libya there are 2042 plant species that belong to 818 genera and 168 families. In flora of Libya, 85 endemic taxa were recorded, more than 55 % distributed in Al-Jabal Akhder region. In the present study 52 species are recorded as new to the flora of Libya. Plant life-forms were characterized by the highest percentage of Therophytes (47.3 %), Chamaephytes (27.9 %), Phanerophytes (12.9 %) and Cryptophytes (11.9 %). Ethnobotany studies showed that more than 280 medicinal plants found in Libya were 188 species recorded in Al-Jabal Akhder region from these, 22 plants used as honey production. The geographical elements of Libyan flora are dominated by the Mediterranean elements and are represented by 50 % of the total flora of Libya.

Keywords: Taxonomy; Flora of Libya; Endemic species; Floristic study; Medicinal plants

Introduction

Libya a North African country, lies along the southern coast of the Mediterranean, approximately between latitude 18° and 33° North and 9° and 25° East and occupies an area of about 1, 759, 540 km², of which more than 90% is desert, except the coastal strip and Al-Jabal El-Akhdar region (*El-Darier and El-Mokaspi 2009*). The coastal belt which extends from the Tunisian to the Egyptian borders is about 5.2 % of the whole region (*Boulos 1972*). This area is quite fertile and receives an adequate amount of rainfall in winter, particularly in the east and west, thus a great part of this belt exhibits the typical Mediterranean flora. The climate of the country varies from arid to highly arid with a great scarcity of rainfall (*Keith 1965*). The history of plant exploration in Libyan flora dates back to 1703, when Lamaire made some observations about *Sylphium* which he called selfione. *Sylphium* was one of the most important extinct plant species in Cyrenaica. In 1824, Viviani wrote a book entitled *Flora Libycae specimen*, he included 1200 plant samples (*Al-Hamedi 1999*). With the beginning of the nineteenth century, *Durand and Barratte (1910)* published *Florae Libycae Prodromus*. It was the first attempt to write about the flora of the whole country, and included 1026 species and 20 plates. *Beguinet, Borzi, Corti and Trotter* are among many Italian botanists who contributed a considerable amount to our knowledge on the flora and vegetation of Libya through their important works during the period 1910- 1942. *Pampanini* published two books: one in 1914 was entitled *Plantae Tripolitanae* while the second, *Prodromo Della Flora Cirenaica*, was published in 1931 (*Pampanini 1931*). *Keith (1965)* published *A Preliminary Check List of the Flora of Libya*, and made many remarks about the uses of plants along with listing their vernacular names. Pioneer explorers of the flora of Libya were mostly Europeans who kept their collections in European herbaria. *Boulos (1972)* published a bibliography which included existing literature up to 1971 about the flora and vegetation of Libya. He made an extensive collection from different parts of Libya, and participated in establishing



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the herbarium Tripoli University (ULT). Tripoli University (1976), with the financial support of the Arab Development Institute, took up the flora of Libya project. The results were published between 1976 and 1989 (El-Mokasabi 2010). Unfortunately much of the collections of Libyan plants are outside Libya, in the herbaria of Europe (Boulos 1972), most important being in the Herbarium of the University of Florence, Italy (FI). Recently, numerous studies were published on the flora of Libya, but few have dealt with its vegetation analysis. This study will form the nucleus exhaustive work on Libyan flora and gives researcher general basic information of the wild flowering plants of Libya were these will provide valuable information for the future conservation and management strategies of these natural resources in Libya.

Methods

This study is based on the analysis of flora by Ali and Jafri (1976-1977), Jafri and El-Gadi (1977-1986) and El-Gadi (1988-1989) and also by intensive field work upon several visits between the periods of 2007 - 2015 to the different locations in Libya especially in Eastern regions of Libya. This study is a complement to those studies concerned on flora and vegetation of Libya.

Results and Discussion

This study showed that there are 2042 species belonging to 818 genera and 168 families in Libya. Pteridophytes are represented by 10 families, 12 genera and 15 species. Gymnosperms are represented by 6 families including 8 genera and 12 species. Angiosperms are represented by 152 families including 798 genera and 2015 species. Dicotyledons are represented by 123 families, 634 genera and 1600 species. Monocotyledons are represented by 29 families, 164 genera and 415 species **Table 1**. The flora of Libya includes 2042 plant species, or 50% of the total plant species of the Libyan flora are confined to the Aljabal Akhder region. Dicotyledons are represented by 1615 species and Monocotyledons by 415 species. The ratio of Dicotyledons to Monocotyledons is roughly 4:1. It will be noted that many number of exotic species from Australia, Brazil, Egypt and other countries are recorded (more than 230 species), these species cultivated as forest, ornamental and economic species. The poisonous plants recorded in the flora of Libya are 93 species represented by 74 genera and 41 families as *Thapsia garganica* and *Datura innoxia*, parasite species with 19 species belonging to 5 genera and 4 families as *Cuscuta planiflora* and *Cytinus hypocistis*, hydrophytes species represented by 26 species belonging to 15 genera and 14 families as *Adiantum capillus-veneris* and *Posidonia oceanica* while, halophytes belong to seven families and are the most important of these families Chenopodiaceae and Zygophyllaceae. Ethnobotany studies showed that more than 280 medicinal plants found in Libya with a long history of traditional uses, were 188 species recorded in Al-Jabal Akhder region from these, 22 plants used as honey production.

Aljabal Akhder is floristically one of the richest regions of Libya, nearly 50% of the total number of species recorded in Libya occurs in the Aljabal Akhder region. The total number of plant species is 2042, this cannot be considered a very rich flora as compared to the large area of the country.

The flora of Libya still need extensive studies as it is far from being fairly known. Both floristic and monographic studies should go parallel to each other in order to achieve a reasonable level of knowledge of that flora within a reasonable time.

Plant groups	No. of species	No. of genera	No.of families	No. of endemic species
1. Peterideophytes	15	12	10	-
2. Gymnosperms	12	8	6	2
3. Angiosperms	2015	798	152	83
a. (Dicotyledons)	(1600)	(634)	(123)	(68)
b. (Monocotyledons)	(415)	(164)	(29)	(15)
Total	2042	818	168	85

Table 1: Plant groups in the flora of Libya.

The largest family is Asteraceae (Compositae) which is represented by 240 species and 97 genera (with 18 endemic species). The next largest family is Poaceae (Graminae) with 233 species followed by Fabaceae (Leguminosae) with 208 species **Table 2**. More than 42 families with only one species as Coridaceae, Theligonaceae, Rafflesiaceae, Elatinaceae and Posidoniaceae.

Family	No. of species	No. of genera	No. of endemic species
Asteraceae (Compositae)	240	97	18
Poaceae (Graminae)	233	93	7
Fabaceae (Leguminosae)	208	42	1
Brassicaceae (Cruciferae)	97	59	4
Rubiaceae	90	50	-
Apiaceae (Umbelliferae)	75	39	1
Lamiaceae (Labiatae)	65	22	9
Caryophyllaceae	62	18	5
Boraginaceae	51	23	3
Chenopodiaceae	50	23	-

Table 2: List of some largest families in Libya with number of species, genera and endemic species.

The most characteristic feature of Libyan flora is the large number of genera (818 genus) in proportion to that of species (2042 species). The largest genus in the flora of Libya is Euphorbia, which includes 26 species, *Astragalus* (25 species), *Silene* (23 species), *Trifolium* (22 species), *Allium* and *Medicago* (18 species), *Lotus* and *Erodium* with 15 species, *Convolvulus* and *Stipagrostis* with 14, 13 species respectively **Table 3**. The dominant genera represented more than 9% on the species level, but these all belong to large and widely spread genera in arid regions. Monotypic genera are very common in Libyan flora were the highest monotypic genera recoded in family Poaceae with 17 followed by Brassicaceae with 15 monotypic genera.

Genus	Total No. of species in the Genus	No. of Species in Libya
<i>Euphorbia</i>	2000	26
<i>Astragalus</i>	1750	25
<i>Silene</i>	700	23
<i>Trifolium</i>	240	22
<i>Medicago</i>	85	18
<i>Allium</i>	700	18
<i>Lotus</i>	100	15
<i>Erodium</i>	60	15
<i>Convolvulus</i>	100	14
<i>Stipagrostis</i>	50	13

Table 3: List of some largest genera in Libyan flora.

About 85 endemic taxa are recorded in the Libyan flora belonging to 65 genera and 35 families were the largest genus are *Anthemis* and *Teucrium* with 5 species (Table 4). None of the families in the Libyan flora are endemic. However, the genera *Pachyctenium*, *Libyella* and *Oudneya* are endemic. More than 55% of endemic are found in the Aljabal Akhder region. The concentration of the endemic species in Aljabal Akhder could be due to its peculiar physiographic and climate compared with most of the country. It is bordered by the Mediterranean Sea on the north and west sides, and by the desert in the south. These physiographic and climatic barriers have provided excellent ecological refuge and contributed to the restriction of many endemic taxa (Qaiser and El-Gadi, 1984; El-Mokasabi, 2001; Al-Sodany et al., 2003). Our near-endemics are species known only in Libya and Egypt, or in Libya and Crete such as *Stachys tournefortii* Poir (Table 5). Endemism is fairly low in Libya, since only about 4% of the taxa are endemic. Endemism occurs in 4 main centers, Aljabal Akhder with 59 endemic species of the total endemic species, the coastal belt (26 species), central part of Sahara (8 species) and the southern part of Libya including Jabal Al-Awaynat, Tibesti and Plateau of Ghat (2 species).

Taxon	Family	Life Form	Distribution
<i>Ephedra altissima</i> Desf. var. <i>altissiana</i> Pamp.	Ephederaceae	PHA	Gebel Nafosa- Aljabal Akhder
<i>Cupressus sempervirens</i> L. var. <i>horizontalis</i> (Mill.) Gordon	Cupressaceae	PHA	Aljabal Akhder
<i>Petrohagia cyrenaica</i> (Durand & Barratte) Ball.	Caryophyllaceae	THE	Aljabal Akhder
<i>Silene articulata</i> Viv.	Caryophyllaceae	THE	Benghazi- Tubruk
<i>Silene cyrenaica</i> Maire & Weill.	Caryophyllaceae	THE	Aljabal Akhder
<i>Silene marmarica</i> Beg. & Vacc.	Caryophyllaceae	CHA	Tubruk
<i>Herniaria ericifolia</i> Townsend	Illecebraceae	CHA	Tripoli
<i>Ranunculus cyclocarpus</i> Pamp.	Ranunculaceae	THE	Aljabal Akhder
<i>Hypericum decaisneanum</i> Coss. & Daveau	Guttiferae	CHA	Aljabal Akhder
<i>Capparis spinosa</i> L. var. <i>krugeriana</i> (Pamp.) Jafri	Capparaceae	CHA	Aljabal Akhder
<i>Ammosperma variabile</i> Nigre & L'H'er.	Brassicaceae	THE	Central part of Sahara
<i>Matthiola glutinosa</i> Jafri	Brassicaceae	CHA	Central part of Sahara
<i>Oudneya africana</i> R. Br.	Brassicaceae	PHA	Central part of Sahara
<i>Savignya parviflora</i> (Delile) Webb. ssp. <i>globosa</i> Jafri	Brassicaceae	THE	Central part of Sahara
<i>Reseda pampaniniana</i> Maire & Weill.	Resedaceae	THE	Gebel Nafosa
<i>Sedum bracteatum</i> Viv.	Crassulaceae	THE	Aljabal Akhder
<i>Sedum mirum</i> Pamp.	Crassulaceae	THE	Aljabal Akhder
<i>Medicago cyrenaica</i> Maire & Weill.	Fabaceae	THE	Aljabal Akhder
<i>Erodium keithii</i> Guitt. et L'H'er.	Geraniaceae	THE	Jadoo
<i>Erodium tocranum</i> Guitt. et L'H'er.	Geraniaceae	THE	Aljabal Akhder
<i>Fagonia arabica</i> L. var. <i>membranacea</i> Ghafoor	Zygophyllaceae	CHA	Central part of Sahara
<i>Fagonia longipedicellata</i> Ghafoor	Zygophyllaceae	CHA	Gebel Nafosa
<i>Fagonia sinaica</i> Boiss. var. <i>pseudocretica</i> (Pamp.) Hadidi	Zygophyllaceae	CHA	Central part of Sahara
<i>Polygala aschersoniana</i> Chodat	Polygalaceae	CHA	Aljabal Akhder
<i>Thesium erythronicum</i> Pamp.	Santalaceae	CHA	Aljabal Akhder
<i>Rhamnus alaternus</i> L. ssp. <i>pendulus</i> (Pamp.) Jafri	Rhamnaceae	PHA	Aljabal Akhder
<i>Pachyctenium mirabilis</i> Maire & Pamp.	Apiaceae	THE	Aljabal Akhder
<i>Arbutus pavarii</i> Pamp.	Ericaceae	PHA	Aljabal Akhder
<i>Cyclamen rohlfsianum</i> Asch.	Primulaceae	CRY	Aljabal Akhder
<i>Limonium cyrenaicum</i> (Rouy) Brullo	Plumbaginaceae	CHA	Aljabal Akhder
<i>Limonium subtrotundifolium</i> (Beg. & Vacc.) Brullo	Plumbaginaceae	CHA	Aljabal Akhder
<i>Convolvulus maireanus</i> Pamp.	Convolvulaceae	THE	Aljabal Akhder
<i>Alkanna tinctoria</i> (L.) Tausch. ssp. <i>tripolitana</i> (Bornm.) Qaiser	Boraginaceae	THE	Gebel Nafosa- Tripoli

<i>Nonea viviani</i> DC.	Boraginaceae	THE	Eastern region
<i>Onosma cyrenaicum</i> Durand & Barratte	Boraginaceae	THE	Aljabal Akhder
<i>Ballota andreuzziana</i> Pamp.	Lamiaceae	CHA	Aljabal Akhder
<i>Micromeria guichardii</i> (Quezel & Zaffran) Brullo & Furnari	Lamiaceae	CHA	Aljabal Akhder
<i>Nepeta cyrenaica</i> Quezel & Zaffran	Lamiaceae	THE	Aljabal Akhder
<i>Origanum cyrenaicum</i> Beg. et Vacc.	Lamiaceae	CHA	Aljabal Akhder
<i>Teucrium apollinis</i> Maire & Weill.	Lamiaceae	CHA	Aljabal Akhder
<i>Teucrium barbeyanum</i> Asch.	Lamiaceae	THE	Aljabal Akhder
<i>Teucrium davaeanum</i> Coss.	Lamiaceae	CHA	Eastern region
<i>Teucrium lini-vaccarii</i> Pamp.	Lamiaceae	CHA	Mesellata - Tarhuna
<i>Teucrium Zanonii</i> Pamp.	Lamiaceae	CHA	Eastern region
<i>Linaria laxiflora</i> Desf. ssp. <i>calcarlongum</i> Qaiser	Scrophulariaceae	THE	Benghazi-Kararim
<i>Linaria tarhunensis</i> Pamp.	Scrophulariaceae	THE	Gebel Nafosa-Tarhuna
<i>Parentucellia floribunda</i> Viv.	Scrophulariaceae	THE	Aljabal Akhder
<i>Orobanche cyrenaica</i> Beck	Orobanchaceae	THE	Aljabal Akhder
<i>Valerianella petrovichii</i> Asch.	Valerianaceae	THE	Aljabal Akhder- Tripoli
<i>Scabiosa libyca</i> Alavi	Dipsacaceae	THE	Aljabal Akhder
<i>Scabiosa oberti-manetti</i> Pamp.	Dipsacaceae	CHA	Gebel Nafosa
<i>Campanula monodiana</i> Maire	Campanulaceae	THE	Tibesti
<i>Anthemis cyrenaica</i> Coss. var. <i>cyrenaica</i>	Asteraceae	THE	Aljabal Akhder
<i>Anthemis cyrenaica</i> Coss. var. <i>radiata</i> Pamp.	Asteraceae	THE	Aljabal Akhder
<i>Anthemis glareosa</i> Durand & Barratte	Asteraceae	THE	Coastal belt
<i>Anthemis krugeriana</i> Pamp.	Asteraceae	THE	Coastal belt
<i>Anthemis taubertii</i> Durand & Barratte	Asteraceae	THE	Aljabal Akhder
<i>Bellis sylvestris</i> Cyr. var. <i>cyrenaica</i> Beg.	Asteraceae	CHA	Aljabal Akhder
<i>Carthamus divaricatus</i> Beg. & Vacc.	Asteraceae	THE	Eastern region
<i>Centaurea cyrenaica</i> Beg. & Vacc.	Asteraceae	CHA	Aljabal Akhder
<i>Cicerbita haimanniana</i> (Asch.) Beauv.	Asteraceae	CRY	Aljabal Akhder
<i>Crepis senecioides</i> Delile.	Asteraceae	THE	Aljabal Akhder
<i>Cynara cyrenaica</i> Maire & Weill.	Asteraceae	CHA	Aljabal Akhder
<i>Echinops cyrenaicus</i> Durand & Barratte	Asteraceae	CHA	Aljabal Akhder
<i>Evax libyca</i> Alavi	Asteraceae	THE	Gebel Nafosa
<i>Onopordum cyrenaicum</i> Maire & Weill.	Asteraceae	THE	Aljabal Akhder
<i>Pallenis cyrenaica</i> Alavi ssp. <i>filiformis</i> (Viv.) Alavi	Asteraceae	CHA	Aljabal Akhder
<i>Perralderia garamantum</i> Asch.	Asteraceae	CHA	Misda - Weshka
<i>Picris mauginiana</i> Pamp.	Asteraceae	THE	Benghazi - El-Abiar
<i>Tripleurospermum philaenorum</i> (Maire & Weill.) Alavi	Asteraceae	THE	Coastal belt
<i>Allium negrianum</i> Maire & Weiller	Alliaceae	CRY	Aljabal Akhder
<i>Allium ruhmerianum</i> Asch.	Alliaceae	CRY	Eastern region
<i>Bellevalia cyrenaica</i> Maire & Weiller	Liliaceae	CRY	Aljabal Akhder
<i>Muscari stenanthum</i> Freyn	Liliaceae	CRY	Gharian
<i>Crocus boulosii</i> Greuter	Iridaceae	CRY	Aljabal Akhder
<i>Romulea cyrenaica</i> Beg.	Iridaceae	CRY	Aljabal Akhder-
<i>Cynosurus junceus</i> Murb.	Poaceae	THE	Aljabal Akhder
<i>Libyella cyrenaica</i> (Durand & Barratte) Pamp.	Poaceae	THE	Benghazi
<i>Poa vaginata</i> Pamp.	Poaceae	THE	Aljabal Akhder- Tripoli
<i>Poa pentapolitana</i> Scholz	Poaceae	THE	Aljabal Akhder
<i>Stipagrostis libyca</i> (Scholz) Scholz in Osterr.	Poaceae	THE	Aljabal Akhder- Fezzan

<i>Stipagrostis shawii</i> (Scholz) Scholz in Osterr.	Poaceae	THE	Jabal Al-Awaynat
<i>Trisetaria vaccariana</i> (Maire et Weiller) Maire	Poaceae	THE	Aljabal Akhder
<i>Arum cyrenaicum</i> Hruby.	Araceae	CRY	Aljabal Akhder
<i>Orchis cyrenaica</i> Durand & Barratte	Orchidaceae	CRY	Aljabal Akhder

Table 4: List of the endemic taxa in the flora of Libya. (Phanerophytes = PHA, Chamaephytes = CHA, Cryptophytes = CRY, Therophytes = THE)

Species	Family	Occurrence
<i>Argania spinosa</i> (L.) Skeels	Sapotaceae	North Africa
<i>Bellevalia sessiliflora</i> (Viv.) Kunth	Hyacinthaceae	Libya, Egypt
<i>Carduncellus mareoticus</i> (Delile) Hanelt	Compositae	Egypt, Libya
<i>Carthamus glaucus</i> M.Bieb.	Compositae	Egypt, Libya
<i>Centaurea alexandrina</i> Delile	Compositae	Egypt, Libya
<i>Echinops galalensis</i> Schweinf.	Compositae	Libya, Egypt
<i>Enarthrocarpus pterocarpus</i> (Pers.) DC.	Cruciferae	Libya, Egypt
<i>Stachys tournefortii</i> Poir.	Labiatae	Libya, Crete
<i>Suaeda monodiana</i> Maire	Chenopodiaceae	North Africa
<i>Valantia lanata</i> Delile ex Coss.	Rubiaceae	Libya, Egypt
<i>Valerianella petrovitchii</i> Asch.	Valerianaceae	Libya, Egypt
<i>Verbascum letourneuxii</i> Asch. & Schweinf.	Scrophulariaceae	Egypt, Libya

Table 5: Near-endemic species in the flora of Libya.

In a series of recent publications by various authors 52 more species of flowering plants were added to the flora of Libya **Table 6**. These, however; bring the total number of plant species into 2094. This exceeds the previous estimate of 1600 by *Boulos (1972)* and 1750 by *Qaiser and El-Gadi (1984)*. It is interesting to note that more than 70 % of the plant species is confined to the coastal belt region. On the other hand, the flora of Libya with its new estimate (2094 species) still cannot be considered a very rich flora as compared to the large area of the country. A thorough survey of Libyan region is required, and it is hoped that it may reveal some more interesting species. The continuation of more collections and studies to different regions of Libya is indeed very important and highly recommended in order to enrich our flora.

New records	Family	Distribution
<i>Abutilon fruticosum</i> Guill. & Perr.	Malvaceae	Tripoli (<i>El-Gadi et al.1987</i>)
<i>Allenia austrani</i> (Post.) Zoh.	Chenopodiaceae	Gyryain (<i>Erteeb and Sharashi 2015</i>)
<i>Amaranthus blitoides</i> S. Watson	Amaranthaceae	El-Batnan (<i>El-Sharei 2002</i>)
<i>Antirrhinum ramosissimum</i> Coss.	Scrophulariaceae	Alhamada (<i>Erteeb and Sharashi 2015</i>)
<i>Astragalus massiliensis</i> (Mill.) Lam.	Fabaceae	El- Tamimmi (<i>Sherif et al.,1990</i>)
<i>Bromus uniolooides</i> (Willd.) H. B. K.	Poaceae	Tripoli (<i>Sherif 1992</i>)
<i>Bupleurum gibraltarium</i> Lam.	Apiaceae	Msalata (<i>Salam 2008</i>)
<i>Carduus argentatus</i> L. var: <i>getulus</i> (Pomel) Nadia	Asteraceae	Elzawia (<i>Nadia 2009</i>)
<i>Carthamus nitida</i> Boiss.	Asteraceae	Tubruk (<i>Alhabony 1999</i>)
<i>Chloris gayana</i> Kunth	Poaceae	Brak (<i>Erteeb and Sharashi 2015</i>)
<i>Citharexylum cinerum</i> L.	Verbenaceae	Tripoli (<i>Erteeb and Sharashi 2015</i>)
<i>Clematis montana</i> Buch.	Ranunculaceae	Wadi Aqer (<i>Alhemedi 1999</i>)

<i>Clematis vitalba</i> L.	Ranunculaceae	Wadi Aqer (Alhemedi 1999)
<i>Commicarpus verticillatus</i> (Poir.) Standl.	Nyctaginaceae	Jabal Sawda (El- Gadi et al. 1987)
<i>Coronilla emerus</i> L. subsp. <i>emeroides</i> (Boiss. & Sprun.) Hayek	Fabaceae	Aljabal Akhder (El- Gadi et al.1987)
<i>Cuscuta monogyna</i> Vahl	Cuscutaceae	Wadi Merqus (Sherif et al. 1991)
<i>Dittrichia graveolens</i> (L.) Greuter.	Asteraceae	Aljabal Akhder (Sherif et al.1990)
<i>Eriochloa fatmensis</i> (Hochst. & Steud.) Clayton	Poaceae	Tripoli (Siddiqi 1992)
<i>Eucalyptus lehmanni</i> Preiss	Myrtaceae	Aljabal Akhder (Sherif et al.1990)
<i>Euphorbia hirta</i> L.	Euphorbiaceae	Tripoli (Sherif and Ben-Othman 1992)
<i>Ferula biverticillata</i> Thieb	Apiaceae	Aljabal Akhder (Erteeb and Sharashi 2015)
<i>Flaveria bidentis</i> (L.) Kuntze	Asteraceae	Murzuq (Erteeb and Sharashi 2015)
<i>Glinus lotoides</i> L.	Molluginaceae	Aljabal Akhder (Erteeb and Sharashi 2015)
<i>Halogeton alopecuroides</i> (Delile) Moq.	Chenopodiaceae	Tubruk (Alhabony 1999)
<i>Herniaria hirsuta</i> L.	Illecebraceae	Tubruk (Alhabony 1999)
<i>Lactuca saligna</i> L.	Asteraceae	Gyryain (Shoob 2008)
<i>Lactuca viminea</i> (L.) J. Presl & C. Presl	Asteraceae	Tarhuna (Greuter and Raus 2006)
<i>Nicotiana plumbaginifolia</i> Viv.	Solanaceae	Tripoli (Sherif et al.1990)
<i>Oenothera laciniata</i> Mill.	Onagraceae	Tripoli (Mahklouf 2016)
<i>Physalis alkekengi</i> L.	Solanaceae	Sobrata (Lobna 2008)
<i>Physalis philadelphicus</i> Lam.	Solanaceae	Elzawia (Erteeb and Sharashi 2015)
<i>Picris echioides</i> L.	Asteraceae	Aljabal Akhder (Erteeb and Sharashi 2015)
<i>Pimpinella cretica</i> Poir. var: <i>cretica</i> Lam.	Apiaceae	Gyryain (Shoob 2008)
<i>Pisum syriacum</i> (Berg.) E. Lehm.	Fabaceae	Tripoli (El- Gadi et al.1987)
<i>Plantago bellardii</i> All. subsp. <i>bellardii</i> All.	Plantaginaceae	Gyryain (Shoob 2008)
<i>Polygonum alpinum</i> L.	Polygonaceae	Wadi Zaza (El-Gawhari 2002)
<i>Populus euphratica</i> Olivier	Salicaceae	El-Batnan (El-Sharei 2002)
<i>Retama monosperma</i> (L.) Boiss. subsp. <i>bovei</i> (Spach) Maire	Fabaceae	Aljabal Akhder (El-Mokassbi 2014)
<i>Rumex cyprius</i> Murb.	Polygonaceae	Aljabal Akhder (El-Mokasabi 2010)
<i>Ruta montana</i> L.	Rutaceae	Gyryain (Shoob 2008)
<i>Salsola volkensis</i> Schweinf. & Asch.	Chenopodiaceae	Aljabal Akhder (El-Mokasabi 2010)
<i>Sanguisorba minor</i> Scop. subsp. <i>minor</i> Scop.	Rosaceae	Gyryain (Shoob 2008)
<i>Sanguisorba minor</i> Scop. subsp. <i>verrucosa</i> (Link & Don) Holmboe	Rosaceae	Aljabal Akhder (El-Mokassbi 2014)
<i>Sesbania sesban</i> (L.) Merr.	Fabaceae	Murzuq (Erteeb and Sharashi 2015)
<i>Silybum marianum</i> (L.) Gaertn. var. <i>albiflorum</i> Eig	Asteraceae	Wadi Asra (Asker 1998)
<i>Solanum elaeagnifolium</i> Cav.	Solanaceae	Tripoli and Benghazi (Sherif et al. 1990)
<i>Solanum rostratum</i> Dunel.	Solanaceae	Tripoli (Mahklouf 2016)
<i>Spergula arvensis</i> L.	Caryophyllaceae	Tubruk (Alhabony 1999)
<i>Teucrium lini-vaccarii</i> Pamp.subsp. <i>nafusa</i> Eltag. et Elshr.	Lamiaceae	Gyryain (Eltaguri 2016)
<i>Varthemia iphiona</i> Boiss.	Asteraceae	El-Batnan (El-Sharei 2002)
<i>Vicia hirsuta</i> (L.) Gray	Fabaceae	Tubruk (Alhabony 1999)
<i>Vicia sericocarpa</i> Fenzl	Fabaceae	Aljabal Akhder (Sherif et al.1990)

Table 6: List of new records to the Flora of Libya.

Regarding the life-form spectra **Figure 1**, therophytes have the highest contribution (47.3%), followed by chamaeophytes (27.9%), phanerophytes (12.9%) and cryptophytes (11.9%). The dominance of therophytes is due to the long dry periods during the year in Libya. In general, the characteristic features of most dry areas, where the resources are limited, and cannot support much of the perennial vegetation, had resulted in the high contribution of annuals, which also may be related to their short life cycles (sometimes a few weeks), that enable them to avoid the arid conditions. These also have the ability to produce seeds without the need of a visiting pollinator (Baker 1974; Shaltout et al. 2010), and this facilitates the continuity of their life cycles. While, the presence in high percentages of many plants of chamaeophytes may be due to the very long dry periods in such areas and to the fact that this class is characterized by less erect aerial shoots, which die away in part at the onset of the unfavorable season of the year.

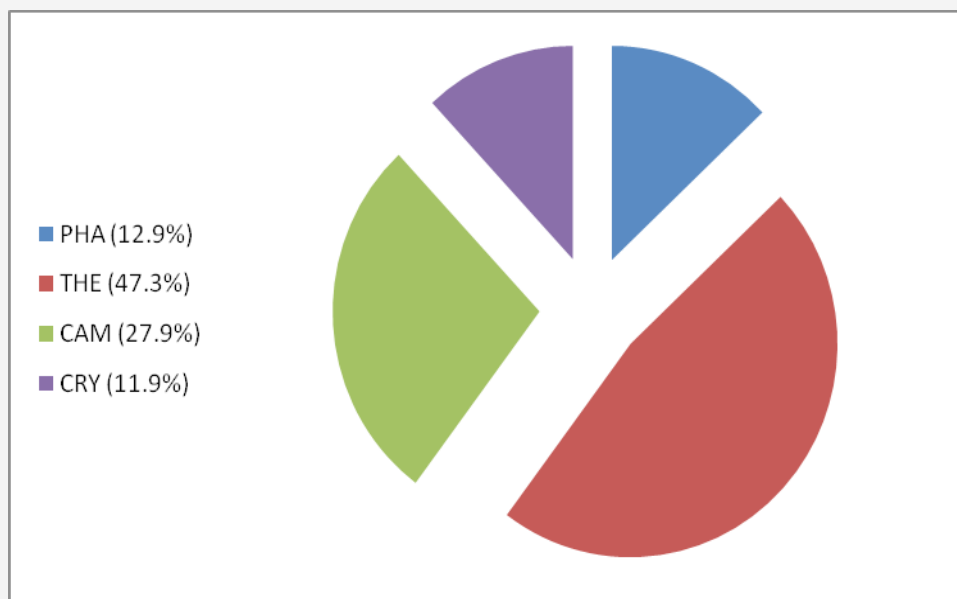


Figure 1: Biological spectrum of plant species in flora of Libya.

Libya falls in to four phytogeographical territories: the Mauritanian Steppe of the Irano-Turanian region, Mediterranean, Saharo-Arabian and Sudanese regions. The flora was quite heterogeneous and composed of various uni-regionals, bi-regional and pluri-regional elements of which Mediterranean elements form the bulk of the flora with more than 50% of the total flora of Libya. It is remarkable to note that more than 90 % of the Mediterranean elements are found in Aljabal Akhder region as *Arbutus pavarii*, *Cyclamen rohlfsianum*, *Quercus coccifera* and *Rosmarinus officinalis*. The high percentage of the Mediterranean element in the Libyan flora may be attributed to the comparatively rich vegetation of the coastal strip which comprises non-deserted climatic provinces. This strip extends about 2.000 km along the coast, including Aljabal Akhder (maximum elevation 882 m), being adjacent to the Mediterranean Sea and receiving an average annual rainfall of 300-600 mm in most of its regions, possesses the richest vegetation and the highest number of species in the country. On the other hand, Gebel Nafosa (maximum elevation about 800 m), and receiving average annual rainfall of 150-300 mm, consequently the percentage of the Mediterranean element may be expected to be much lower than it is in Aljabal Akhder.

From our repeated field trips and observations, the authors has made on the many area of Libya. The flora of Libya suffered extreme degradation mainly danger of genetic erosion of all wild species, because of the heavy use of medicinal plants, overgrazing, woodcutting, agricultural expansion, fires, plant collecting, solid waste pollution, road construction and other factors as drought hazards, diseases, insect and lichens. Similarly, Awada (1996) noted that. Therefore a number of plants are under threat of extinction due to deforestation, habitat destruction and overexploitation such as *Arbutus pavarii*, *Quercus coccifera*,

Pistachia atlantica, *Juniperus oxycedrus*, *Cyclamen rohlfsianum*, *Pancreatium foetidum*, *Globularia alypum*, *Rhus tripartita*, *Ephedra altissima*, *Orchis Cyrenaica* and *Myrtus communis*. There is an urgent need for international assistance to collect the endangered plants and to conserve the genetic resources. The continuation of more collections and studies to different regions of Libya is needed very important and highly recommended in order to enrich our flora.

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