

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/323772475>

Preliminary Investigation of the Vegetation of Wadi Belkaf–Bata Al–Jabal Al–Akhdar–Libya

Article · January 2016

CITATION

1

READS

202

5 authors, including:



Mohamed Adrawi Alaib

University of Benghazi

20 PUBLICATIONS 8 CITATIONS

SEE PROFILE



Ali Elbakkosh

University of Benghazi

3 PUBLICATIONS 1 CITATION

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



PHYTOTOXICITY AND ANTIFUNGAL ACTIVITY OF *Capparis spinosa* L. [View project](#)

Preliminary Investigation of the Vegetation of Wadi Belkaf- Bata Al-Jabal Al-Akhdar-Libya.

Mohamed A. Alaib, Ali M. Elbakkosh, Yousef B Ali, Abdulati S. Gadelmola, and
Abdurrahman M. Elmhafdi

Department of Botany, Faculty of Science, Benghazi University, Libya.

Tel: +218922791077; E-mails: alibakkosh@gmail.com

Received; 20-04-2016, revised; 22-5-2016, Accepted. 25-5-2016

ABSTRACT

Field study of the flora of Wadi Belkaf was conducted during the period between March and April 2015. The objectives of the study were to investigate the vegetation, prepare preliminary list of the species of flowering plants growing in the Wadi and to evaluate human activities in the study area and their consequence on the vegetation cover. The results of the study revealed that the Wadi has a flora of 115 species of flowering plants distributed among 97 genera and 40 plant families. Trees and tall shrubs represented by 14 species (12.2 %) distributed among 10 families, Lianas represented by 2 species (1.7 %) and 2 families, Dwarf shrubs represented by 19 species (16.5 %) distributed among 6 families, perennial herbs represented by 22 species (19.1 %) distributed among 9 families, and annuals represented by 58 species (50.4 %); 11 species belongs to Fabaceae, 13 species belongs to Poaceae and 34 species belongs to different families. Endemic species in the Wadi is fairly low since only 5 species were recorded. These species include; *Allium longanum* Pamp. (Alliaceae), *Cyclamen rohlfsianum* Asch. (Primulaceae), *Plantago cyrenaica* E.A. Durand & Baratte (Plantaginaceae), *Arbutus pavarii* pamp. (Ericaceae), and *Arum cyrenaicum* Hruby (Araceae). Number of medicinal, aromatic, and ornamental plant species were also recorded in this study such as; *Juniperus phoenicea* L., *Marrubium vulgare* L., *Rosmarinus officinalis* L., *Salvia fruticosa* L., *Ceratonia siliqua* L., *Helichrysum stoechas* (L.) Moench, *Teucrium polium* L., *Thymus capitatus* L., *Cistus parviflorus* L., and *Cistus salvifolius* L. Human activities in the study area include; dry farming, grazing, and bees keeping. It seems that these activities are under control up to now as a result of conservation policy employed by the land owners.

Keywords: Wadi Belkaf, Cyrenaica, Flora, Endemic, Life forms.

1. INTRODUCTION

The history of exploitation of the flora and vegetation of Cyrenaica dates back to 1703 when Lemaire [1] made some observation about *Sylphium* plant. Dela-Cella [2] made the first systematic collection of Libyan plants; he collected some 260 species along the coastal strip, from Tripoli to the Egyptian borders, from which 132 species from Cyrenaica. Pachó [3], collected some 39 species of flowering plant from Cyrenaica. Beechy and Beechy [4], surveyed the plants of the coastal plain between Tripoli and Derna. They collected about 13 species from Cyrenaica. The important work of Rohlfs [5] provided the most

comprehensive information on the vegetation of Tripolitania, Fezzan, Ghadames, Kufra, Aoujila and Cyrenaica as well as a list of vernacular names of plants. Taubert also made rich collection from the Cyrenaica. He collected about 485 species of flowering plants [6]. Durand and Baratte [7] published "Flora Libycae Prodromus". It was the first attempt to bring out a consolidated flora of Libya. Some 1026 species have been dealt with but unfortunately neither description of species nor keys were provided in his work. Vaccari [8] made rich collections along the coastal plane from Benghazi to Tubruk. In his work give important information on the vegetation of

Cyrenaica. He collected about 559 species of flowering plants. Floristically, Cyrenaica is relatively well known, and all records up to 1930 are contained in the comprehensive "Prodrmo Della Flora Cyrenaica" [6]. In his work Pampanini dealt with all plant groups of Libya. He described species and provided keys for their identification. Maugini [9] made observations on the pastures of Cyrenaica. He found that the vegetation of these pastures is represented by 35 families of flowering plants. Maire and Weiller [10], studied Cyrenaica region making many remarks on the flora and vegetation. Sand with and Simpson [11], also summarized the history of investigation on the Libyan Flora and listed a number of a new taxa to Cyrenaica. Gimingham and Walton [12], studied the structure of scrub communities on the lime stone plateau of northern Cyrenaica. The study included distribution of some species and their relative dominance and variations. They found that south facing wadi slopes, which suffer from more desiccating conditions than their northward oriented representations of the less well adapted species, dominate in these demanding conditions. Boulos [13], compiled a bibliography which includes existing literature up to 1971 on the flora and vegetation of Libya. He made extensive collections from different parts of Libya and participated in the formation of the nucleus of the Herbarium of Tripoli University. Keith [14] published "A preliminary Check List of the Flora of Libya", though this work without description of species and keys for their identification. It was a very useful compilation as it contains many remarks about the uses of plants and their vernacular names. Tripoli University, with the financial support of Arab Development Institute has taken up "The Flora of Libya Project" to bring out a proper flora of the country. Descriptions of individual families were published separately during 1976 to 1989; volumes 1-24 by Ali and Jafri [15], volumes 25-144 by Jafri and El-Gadi [16] and the volumes 145-147 by El-Gadi [17]. Faruqi [18] has studied Libyan grasses described a new generic record from Libya. Brullo and Furnari [19] provide critical taxonomic and nomenclatural notes on the flora of the Cyrenaica and described several new taxa. Brullo [20, 21, 22, 23, 24] has

published many papers on Libyan plants described several new taxa and made many nomenclatural changes. Brullo and Pavone [25], and Bartolo *et. al.* [26] have studied cytotaxonomy of some Liliaceae from Cyrenaica. Qaiser and El-Gadi [27] have published a critical analysis of the flora of Libya. They have listed the endemic plants and also reorganized their four centers of endemism in Libya. El-Gadi *et. al.* [28] have reported some species which have not been previously recorded in Libya. El-Sherif *et. al.* [29] published a list of plants from wadi Murqus in Al-Jabal Al-Akhdar. Also in this study they recognized *Cuscuta monogyna* as a new record in Libya. Mugasaby and Alaib [30] worked on vegetation of a sector of Mediterranean coastal region in Libya and studied life forms in this region. El-Sherif and Sing [31] worked on the vegetation and flora of Benghazi, and found that the total of 573 species of flowering plants belonging to 373 genera and representing 97 families among them 377 are indigenous species. Al-Humidi [32] surveyed the vegetation of wadi Al-Agar, she recorded 317 taxa of the vascular plants. These taxa are belonging to 66 families two families of Gymnosperms and remaining 64 families are belonging to Angiosperms. Dicotyledons are represented by 262 species, 171 genera and 55 families and Monocotyledons are represented by 51 species, 37 genera and 9 families. Asker [33] worked on the vegetation and flora of wadi Al-Ashra and found that the total of 237 species of flowering plants belonging to 148 genera and 57 families. The present study is an attempt to establish the basis for a more intensive approach to study the different wadi ecosystems of Al-Jabal Al-Akhdar, which was started with the studies of Wadi Murqus ; Wadi Al-Asrha and Wadi Al-Agar . This study is a continuation of these studies, will focus on flora of Wadi Belkaf in the north western part of Al-jabal Al—Akhdar (Bata). The specific objectives of the study were to investigate the vegetation, prepare preliminary list of the species of flowering plants growing in the Wadi and to evaluate human activities in the study area and their consequence on the vegetation cover.

2. EXPERIMENTAL:

2.1 Site description

2.1.1 Location: The study area is located on the eastern coast of Libya in Al – Jabal Al-Alkhdar region. It lies between 20 45'00" and 20 01'42" E longitude and 32 35'00" and 32 01'15" N latitude .It extends approximately for 20 Km from north (the end point of the Wadi in the sea) to south direction between Buta in the east and Tolmeta in the north east. The area rises to about 380m above the sea level

2.1.2 Physiography: According to physiographic features, the study area can be divided morphologically into three parts:

The Upper terrace (about 380 m above sea level) comprise the southern part of the Wadi, from west Bata village, to the start point in the catchments basin and formed stream which was shallow and increasing in the depth wherever there be directed to north.

The middle terrace (150-300 m above sea level) wider in comparison to lower and upper terraces, it forms a belt, which is covered by dense vegetation while the Wadi bed covered by gravel and alluvial deposits. In general is comprised two slopes. The first is opposite to the north and is covered by dense vegetation. The second opposite to the south, and have low vegetation.

The lower terrace (0-100 m) cuts the coast plain region at the Tolmta village. In this part the Wadi is less deep, ended by open region to the sea. In general the Wadi is represented by the gravel land, alluvium clay. The sand dunes are present at the north of the Wadi near the sea, which covered by halophytic plants.

2.1.3 Soils: The influence of the soil genesis factors, such as climate, vegetation and parent material is more or less reflected in the profile characteristics of the soils. In general the area are composed of Eocene rocks (Tertiary) which consist of nummulitic limestone in part chalky, marly and cherty, while quaternary deposits occur mainly on the coastal plain mostly, along the slopes of the hills namely Colluvium and in the Wadi bottoms namely Alluvium. The major soil types found in the area are, terrarossa is dominant in the upper terrace and alluvium loam-clayey in the bottom, while eolian sand area soil dominate at the narrow area along coastal plain.

2.1.4 Climate: The climatic conditions prevailing in the study area which is a part of Al-Jabal Al- Alkhdar, has Mediterranean climate .Cyclonic rains occur in winter, and the hot, dry summer is a result of high-pressure zone. The main characteristics of the climate in this area are instability caused by the contrary effects of the Sahara and the sea.

The rainfall in the study area is markedly seasonal and irregular in amount .The annual rainfall at the area varies considerably around the mean from one month to another, year to year. Most of the rainfall occurs in late autumn and early spring (during the period between Octobers a March). The peak rainy months are December, January and February. In general the rainfall starts in the month of October sometime in September and extends up to March sometime up to April. It was low as 295.1 mm and as high as 648 mm. The annual mean about 418.6 mm.

Temperature varied considerably from summer to winter. In general the winter extends from December to March but December, January and February are the coolest months and the summer extends from May to August; June and July being the hottest months of the year. The monthly mean temperature varies; it is 7.2 C° in February and 29.8C° in June.

The relative humidity in general was high in the study area. The monthly. mean however, varies from 53.3% (June)to 76.6% (January) January, February , December and November are the most humid months of the year , where the relative humidity is above 70.9% as the maximum and the minimum below 54.3% in May and June .

In Al-Jabal Al-Akhdar variations in wind velocity are less distinct than those of other climatic features. The northern and north-western wind is dominant in the study area. It is humid wind and make the air cooler in the winter and brings the rain. While the southern and south- western winds in summer make the air warmer. The average wind speed of the study area varies from 8.3 Km/h (October) to 11.1Km/h (April).

2.2 Field trips

Two field trips were carried out during the period between March and April, 2015. During this period most of plants are in flowering condition. We did not collect any plant samples from the site, we had only investigated, identified, and took photographs of the plants in the site to avoid destruction of vegetation. The identification of the specimens was done by

utilization of available taxonomic literature (see references).

The investigation restricted on Upper terrace of the Wadi (about 380 m above sea level) which comprise the southern part of the Wadi, from west Bata village, to the start point in the catchments basin and formed stream which was shallow and increasing in the depth wherever there be directed to north because of the many problems we had faced .

3. RESULTS AND DISCUSSIONS:

The results of preliminary survey of Wadi Belkaf show that the Wadi has flora of 115 species of flowering plants distributed in 97 genera and 40 families; one family of Gymnosperms and remaining 39 families are belonging to Angiosperms.

Dicotyledons are represented by 87 species, 70 genera and 33 families and Monocotyledons are represented by 28 species, 27 genera, and 6 families (Table:1). The analysis of the distribution of the species (Table:2) shows that Poaceae represented by 19 species, Asteraceae by 18 species, Lamiaceae by 10 species, Fabaceae by 9 species, Apiaceae by 5 species; Cistaceae by 4 species, Plantaginaceae and Oleaceae represented by 3 species each. In addition 15 families represented by 2 species each and 17 families represented by 1 species each. The first four families considered the dominant families in Libyan flora in terms of species number [34]. Poaceae however, comes first in species number (19 species) in Wadi Belkaf while in the Libyan flora Asteraceae is number one in species number.

Table1: Different Taxonomic Groups Present in Wadi Belkaf .

| Plant groups | No. of species | No. of genera | No. of families |
|----------------|----------------|---------------|-----------------|
| Gymnosperms | 2 | 2 | 1 |
| Dicotyledons | 85 | 68 | 32 |
| Monocotyledons | 28 | 27 | 7 |
| <i>Total</i> | 115 | 97 | 40 |

The results also show the life forms distribution among the species of the Wadi (Table:3) characterized by a high proportion of annuals (50.4 %) and perennial herbs (19.1 %), unlike the low number of dwarf shrubs (16.5 %), trees and tall shrubs (13 %) and Lianas (0.9%) only. These reflect defensive capabilities of vegetation in semi-arid condition [34]. Endemic species in the Wadi is fairly low since only 5 species (4.5 % of the recorded species in the Wadi) were recorded. These species include; *Allium longanum* Pamp. (Alliaceae), *Cyclamen rohlfsianum* Asch. (Primulaceae), *Plantago cyrenaica* E.A. Durand & Barratte (Plantaginaceae), *Arbutus pavarii* Pamp. (Ericaceae), and *Arum cyrenaicum* Hruby (Araceae)

(Table:4). These results in agreement with Qaisar and El Gadi [27] in their comprehensive analysis of the flora of Libya in which they reveal that number of endemic species in flora of Libya not more than 4%. Number of medicinal, aromatic, and ornamental plant species were also recorded in this study such as; *Juniperus phoenicea* L., *Marrubium vulgare* L., *Rosmarinus officinalis* L., *Salvia fruticosa* L., *Ceratonia siliqua* L., *Helichrysum stoechas* (L.) Moench, *Teucrium polium* L., *Thymus capitatus* L., *Cistus parviflorus* L., and *Cistus salvifolius* L. and others (Table:5). These species of medicinal plants are known in Folk Medicine in Al-Jabal Al-Akhdar and well documented [35].

Table2: Plant families arranged according to the number of species

| No | Family | # of species | No | Family | # of species |
|----|-----------------|--------------|----|-----------------|--------------|
| 1 | Poaceae | 19 | 22 | Rubiaceae | 2 |
| 2 | Asteraceae | 18 | 23 | Alliaceae | 1 |
| 3 | Lamiaceae | 10 | 24 | Adoxaceae | 1 |
| 4 | Fabaceae | 9 | 25 | Anacardiaceae | 1 |
| 5 | Apiaceae | 5 | 26 | Asclepiadaceae | 1 |
| 6 | Cistaceae | 4 | 27 | Asphodelaceae | 1 |
| 7 | Plantaginaceae | 3 | 28 | Apocynaceae | 1 |
| 8 | Oleaceae | 3 | 29 | Caesalpiniaceae | 1 |
| 9 | Araceae | 2 | 30 | Dipsacaceae | 1 |
| 10 | Asparagaceae | 2 | 31 | Fagaceae | 1 |
| 11 | Brassicaceae | 2 | 32 | Globularaceae | 1 |
| 12 | Caprifoliaceae | 2 | 33 | Hypericaceae | 1 |
| 13 | Caryophyllaceae | 2 | 34 | Linaceae | 1 |
| 14 | Cuperessaceae | 2 | 35 | Liliaceae | 1 |
| 15 | Convolvulaceae | 2 | 36 | Papaveraceae | 1 |
| 16 | Cyperaceae | 2 | 37 | Ranunculacea | 2 |
| 17 | Ericaceae | 2 | 38 | Rhamnaceae | 1 |
| 18 | Euphorbiaceae | 2 | 39 | Rosaceae | 1 |
| 19 | Geraniaceae | 2 | 40 | Valerianaceae | 1 |
| 20 | Malvaceae | 2 | | | |
| 21 | Primulaceae | 2 | | | |

Table3: Life forms in Wadi Belkaf.

| Life forms | No. of species | % |
|-----------------------|----------------|------|
| Trees and Tall Shrubs | 14 | 12.2 |
| Lianas | 2 | 1.7 |
| Dwarf Shrubs | 19 | 16.5 |
| Perennial Herbs | 22 | 19.1 |
| Annuals | 58 | 50.4 |
| <i>Total</i> | 115 | 100 |

Table4: Endemic Species Recorded in Wadi Belkaf.

| Species | Family |
|--|----------------|
| <i>Allium longanum</i> Pamp. | Alliaceae |
| <i>Arbutus pavarii</i> Pamp. | Ericaceae |
| <i>Arum cyrenaicum</i> Hruby | Araceae |
| <i>Cyclamen rohlfsianum</i> Asch | Primulaceae |
| <i>Plantago cyrenaica</i> E.A. Durand & Barratte | Plantaginaceae |

Table5: Medicinal Plants Recorded in Wadi Belkaf.

| Species | Family | Species | Family |
|--|-----------------|---|----------------|
| <i>Asparagus aphyllus</i> L. | Asparagaceae | <i>Rosmarinus officinalis</i> L. | Lamiaceae |
| <i>Asphodelus microcarpus</i> Viv. | Asphodelaceae | <i>Salvia fruticosa</i> L. | Lamiaceae |
| <i>Ceratonia siliqua</i> L. | Caesalpiniaceae | <i>Teucrium polium</i> L. | Lamiaceae |
| <i>Cistus parviflorus</i> L. | Cistaceae | <i>Teucrium barbeyanum</i> Asch&Taub ex E.J .Durand&Barratte | Lamiaceae |
| <i>Cistus salvifolius</i> L. | Cistaceae | <i>Thymus capitatus</i> L. | Lamiaceae |
| <i>Helichrysum stoechas</i> (L.) Moench | Asteraceae | <i>Urginea maritima</i> L. | Asparagaceae |
| <i>Juniperus phoenicea</i> L. | Cupressaceae | <i>Cyclamen rohlfsianum</i> Asch | Primulaceae |
| <i>Marrubium vulgare</i> L. | Lamiaceae | <i>Plantago cyrenaica</i> E.A. Durand & Barratte | Plantaginaceae |
| <i>Quercus coccifera</i> L. | Fagaceae | | |

In addition to endemic and medicinal plant species recorded in the study area, considerable number of potential ornamental species found in the Wadi such as *Cistus parviflorus* L., *Cistus salvifolius* L., *Cistus incanus* L., *Cyclamen rohlfsianum* Asch., *Arbutus pavarii* pamp., *Rosmarinus officinalis* L and many more (Table:6). These species need to be surveyed and introduced as ornamental plants by horticulturalist and growers of ornamental plants as indoor or outdoor plants highly adapted to local condition and source of new

income. Human activities in the study area include; dry farming, grazing, collection of medicinal and aromatic plants and bees keeping. It seems that these activities are under control up to now as a result of conservation policy employed by the land owners. In the mean time decline in the number of *Juniperus phoenicea* L. which is considered the climax species in Al-Jabal Al-Akhdar is probably an indication of woodcutting bracts in the past.

Table 6: Potential Ornamental Plants Recorded in Wadi Belkaf.

| Species | Family | Species | Family |
|------------------------------------|-----------------|---|---------------|
| <i>Arbutus pavarii</i> pamp. | Ericaceae | <i>Fumana thymefolia</i> (L.) Spach | Cistaceae |
| <i>Arum cyrenaicum</i> Hruby | Araceae | <i>Helichrysum stoechas</i> (L.) Moench | Asteraceae |
| <i>Asparagus aphyllus</i> L. | Asparagaceae | <i>Pistacia lentiscus</i> L. | Anacardiaceae |
| <i>Asphodelus microcarpus</i> Viv. | Asphodelaceae | <i>Phlomis floccose</i> (D.) Don. | Lamiaceae |
| <i>Ceratonia siliqua</i> L. | Caesalpiniaceae | <i>Quercus coccifera</i> L. | Fagaceae |
| <i>Cistus incanus</i> L. | Cistaceae | <i>Rosmarinus officinalis</i> L. | Lamiaceae |
| <i>Cistus parviflorus</i> L. | Cistaceae | <i>Salvia officinalis</i> L. | Lamiaceae |
| <i>Cistus salvifolius</i> L. | Cistaceae | <i>Smilax aspera</i> L. | Liliaceae |
| <i>Clematis vitalba</i> L. | Ranunculacea | <i>Urginea maritima</i> L. | Asparagaceae |
| <i>Cyclamen rohlfsianum</i> Asch | Primulaceae | <i>Viburnum tinus</i> L. | Adoxaceae |
| <i>Cupressus sempervirens</i> L. | Cupressaceae | | |

REFERENCES

1. Lemair, Les antiquites de la cyrenaique ouil est aussi question du " seltion" que M. Bonnet areconnu etra le *Phlomis floccosa*. France. (1703).
2. Dell- Cella, P. Viggio da Tripoli di Barberia alle frontiere occidentali della Egitto. (1819).
3. Pacho, I .R. Relation d'un voyage dans la marmavigue le Cyrenaique et les oasis d Audjelah et de maraheh Paris. (1827).
4. Beechey, F. W. and H. W. Beechey. proceeding of the. Expedition to explore the northern coast of Africa Tripoli London. (1828).
5. Rohlfs, G. Reise nach kutra und Beschrei, bung der Oase. *Mittlg Afriha –ges Deutschland* (1881). 2:17-39.
6. Pampanini, R. Prodomo della Crenaica Minstero Dello Colonie, Forli. (1931).
7. Durand, E. and Barratte, G. Avec la collaboration de Ascherson P, Muschler, B .W and Apercn Geolg R.Sur la tripdilaira par meunier *Florae Libcae prodromus, on catalogue Raiaonne des plantes de Tripoli*. (1910).
8. Vaccari, E. Contributio alla flora Della Libya Una raccolte botanica dei dintorni di Tripoli. *Arch. Bot.* (1914). 25:189-219.
9. Maugini, A. Flora ed economia agrarian degli indigeni. Minist Colon, Uff study e prop .9. (1931).
10. Weller, M. and Maire, R. M. Contribution a "L" etude de la flora de la Libya, *Bull Soc. Hist. Nat. Afr. Nord.*(1939). 30:255-314.
11. Simpson, D and Sandwith, N. Y.. Addition to the flora of Cyrenaica *J.Bot.* (1941). 79:33-44.
12. Gimingham, C. H. and K. Walton. Environment and the structure of scrub communities on the limestone plateau of northern Cyrenaica. *J.Ecol.* (1954). 42:505-520.
13. Boulos, L. Our present knowledge on the flora and vegetation of Libya. *Webbia* (1972). 26:366-400.
14. Keith, H .G. A preliminary check list of Libyan flora 2 Vols. The government of Libyan Arab Republic, Ministry of Agriculture and Agrarian Reform Tripoli. (1973).
15. Ali, S.I and Jafri, S. M.H.. Flora of Libya Vols. 1- 24 Department of Botany, Tripoli Univ., Tripoli. (1976-1977).
16. Jafri, S .M. H. and A .A .El-Gadi. Flora of Libya. 25-144 Department of Botany, Tripoli Univ., Tripoli. (1977-1986).
17. El –Gadi, A. Flora of Libya. 145-147 Department of Botany Tripoli Univ. Tripoli. (1988-1989).
18. Faruqi, S.A. Studies on the Libya Grasses, II Dinebra a New Generic record from Libya. *Libyan J. Sci* (1979). 9A 13-16.
19. Brullo, S. and F. Furnari. Taxonomic and nomenclatural notes on the flora of Cyrenaica "Libya" *Webbia* (1979). 34 (1):155-174.
20. Brullo, S. Ilgenere (*Limonium*). Miller in Cyrenaica *Webbia* (1978). 33 (1):137-158.
21. Brullo, S. *Asperula tragacathoides* Brullo, Sp. Nov; from Libya. *Batени ska Notiser* (1979). 132:291-293.
22. Brullo, S. Notes on the genus *Salsola* (Chenopodiaceae) .1.The *Salsola oppositifolia* and *S. longifolia* groups, *Willdenowia* (1982). 12:241-247.
23. Brullo, S. L'ordre *Brometalia rubentalia* –Tectori en cyrenaique Septentrionale. *Coll.phytosoc.* (1983). 12:269-281.
24. Brullo, S. Taxonomic consideration on the genus " *Darniella*" "*Chenopodiaceae*" *Webbia* (1984). 38:301-328.
25. Brullo, S, and P. Pavone. *Allinm grenteri* sp nova " Liliaceae " from Cyrenaica and its relationships with the *Allium cuparii* group. *Willdenowia* (1983). 13: 155-122
26. Bartolo, G; S. Brullo; P. Pavora and M .C.Terrasi. Cytotaxonomical notes on some "Liliaceae "of N.Cyrenaica. *Webbia* (1984). 38:601-622.
27. Qaiser, M. and A. El –Gadi. A critical analysis of the flora of Libya. *Libyan J.Sci.* (1994). 13:31-40.
28. El –Gadi, A Ali, S.I and Jafri, S. M.H. Flora of Libya. 145-147 Department of Botany Tripoli Univ. Tripoli. (1987).
29. El –Sherif, M.; Y. El-Barasi; M. Mugasabi; M. El – Adrawi; Y. Shakmahk; and M Gomma. A Contribution to the flora of Wadi Murquis (Jabal El- Akhdar Libya) *Acta. Bot. India* (1991). 19:232-235.

-
30. Mugasaby, M. F. and M. A. Alaib. Vegetation of A sector of Mediterranean coastal region in Libya with special reference to salt marshes. *Seminario Scientifico –Tecnico Dilecce*. (1992).
31. El –Sherif, I.M and V.Singh. Vegetation and flora of Benghazi on the Mediterranean coast of Libya *Advances in plant Sciences Research* (1996). 3:1-68.
32. Al- Humidi, Ramadana I. Floristic and Ecological Study of Vegetation of Wadi Al- Agar. M.Sc Thesis, Botany Department, Faculty of science, Garyounis University. (1999).
33. Asker, A. M. Vegetation and flora of Wadi AL-Asrha (Al-Jabal Al-Akhdar). M.Sc Thesis, Benghazi Univ., Benghazi. (1998).
34. Feng, Ying JIA-Qiang Lei, Xing-Wenu and Bo-Rong Pan. Composition and Characteristics of Libyan Flora. *Arch.Biol.,Sci.*, Belgrade, (2013). 65 (2), 561-657
35. El –Gadi, A. and Bshaina, S.M. Usage of some plants in Libyan Folk Medicine. Vol. 1 & 2. AUP Publication. Zaouia, Libya. (Arabic Document). (1992).
-