



## A survey of medical plants of Cyrene (campus Apollo) Shahat-Al-Jabal Al-Akhdar, Libya.

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## Highlights

- This study includes a preliminary inventory and definition of medicinal plant species in Shahat-Al-Jabal Al-Akhdar area (campus Apollo).
- Preparing a list of medicinal plants and identifying the most dominant hosts in the study area and a life form for each plant.

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## ABSTRACT

AL-Jabal AL-Akhdar region is very rich in diversity in plants, and studies are still few in AL-Jabal AL-Akhdar. This study was 2021/2022, conducted for four seasons. An inventory of the plants of this region was made entirely, and the medicinal plants were counted in the study area. The results indicated the presence of a total of 70 medicinal plant species belonging to 45 families and 67 genera and 68 species. Gymnosperms were represented by only 3 families, 3 genera, and 3 species, 1 sup species. Angiosperms composed the most dominant botanical group with 41 families. Dicotyledons were the most presented group of the angiosperms with 35 families, 7 genera and 58 species, and 1 sup species, whereas Monocotyledons comprised a far less diverse group of medicinal plants in the area study with only 6 families, 7 genera and 7 sup species, pteridophyta, 1 family, 1 genus, 1 species. Asteraceae and Lamiaceae attained the highest number of genera recorded in the study area with 5 genera and 5 species, followed by Fabaceae with 4 genera, 5 genera and 5 species, followed by Fabaceae with 4 genera and 4 species. Our results revealed that the most represented life forms of the medicinal plants in Shahat were Therophytes (Th) (36%) 24 species, Phanerophytes (Ph) (18%) 12 species, Chamaephytes (Ch) (16%) 11 species, followed by Geophytes (G) (10%) 7 species, Heleophytes (H) and Nano-phanerophytes (7%) 5 species, as for Hemicyptophytes, Hydrophytes and Linaes the percentage of their presence was very simple (2%), It is represented by one type for each of them. Also on the list is an endemic and endangered medicinal plant. *Cyclamen rohlfsianum* Aschers, belonging to the family Primulaceae.

## 1. Introduction

Al-Jabal Al-Akhdar is a huge wealthy, a place rich in many types of plants, including endemic plants and medicinal plants that are found only in Al-Jabal Al-Akhdar, with a great diversity of plants that must be preserved. Cyrene is found on the second terrace of Al-Jabal Al-Akhdar, at an elevation of around 600 meters, this historic city was established 631 BC by Greek dealers who frequented the coasts of eastern North Africa (Elbah, 2002). Medicinal plants are frequently utilized in the treatment and prevention of particular afflictions and diseases. They are also thought to help provide healthcare (Sofowora *et al.*, 2013). Despite their significance, medicinal plants are rarely used in an organized industry; the majority are still exploited with little to no thought for the future. The value and application of medicinal plants in healthcare, national conservation efforts in a few selected nations, and World Bank development programs are all included in the article.

The development of national strategies for executing laws governing the preservation, production, processing, and commercialization of medicinal plants is the main topic of the last part (Srivastava *et al.*, 1996). Medicinal plants are of great economic value and special importance for several reasons, the most important of which is that medicinal plants represent the main part of the raw materials on which the drug industry in the world is based (Salme-rón-Manzano *et al.*, 2020). Medicinal plants provide opportunities for many discoveries and more therapeutic and non-therapeutic chemicals of plant origin, such as antibiotics and others. Medicinal

plants are a large group in terms of number, and this group also includes plants that are not only used for medicinal purposes but contain aromatic foodstuffs and food industries. Medicinal plants are found in most flora of the world. A medicinal plant contains in one or more of its various organs or their modifications one or more chemical substances in high or low concentration and has a physiological ability to treat a specific disease or reduce the symptoms of infection with that disease (Atlas, 2012).

Medicinal plants have economic importance to the world. The demand is constantly increasing for medicinal plants, not only in poor developing countries but even in Europe and America, where the trend is now for herbal medicine (Lewington, 1993). It is regarded as one of the most beautiful spots in the world, having been placed first at the London International Tourism Fair. It was the home of the now-extinct silphium plant, which had tremendous medical and economic value (Robinson, 1927). This study came to fill the lack of information and aims at the initial inventory of the types of medicinal plants in the region, defining them, and preparing a list of them, because of their importance.

## 2. Materials and methods

## (a) study area

Cyrene is located in the city of Shahat, which is located east of the city of Al-Bayda, 10 km away in the north-east of Libya (James, 2005). It is located on the second terrace of Al-Jabal Al-Akhdar, at an altitude of approximately 600 meters. The historical base of

the Cyrene area has given the northeast region of Libya the name of Cyrenaica (Clayman, 2014). The area of the study area is about 11,306,561 hectares. Its height is between (555:578) meters. It lies between N 3249'23.952" E21°51'11.1888" Latitude on the North East region, Al Jabal Al-Akhdar.

#### (b) Specimen Collection and Identification

Frequent weekly visits to the study area conducted during the autumn, winter, spring and summer seasons during my year (2021-2022). The plant samples are photographed with a camera before they are collected. Collect plants during the flowering and fruiting period, and annual plants are collected by taking an entire plant, and trees and shrubs by taking a branch about 25 cm with leaves, fruits or flowers. Samples were dried for two weeks by the press and papers, taking into account the change of papers daily, the plant specimens were kept in the herbarium sheet by glue. The plant samples were dissected in the silphium herbarium with the help of the herbarium team, using dissection tools placed under a dissection microscope and identified through Flora Libya books. The plant samples were kept in the silphium herbarium.

### 3. Results and discussions

The results indicated the presence of a total of 70 medicinal plant species belonging to 45 families and 67 genera and 68 species. Gymnosperms were represented by only 3 families, 3 genera, and 3 species, 1 sup species. Angiosperms composed the most dominant botanical group with 44 families. Families dicotyledons were the most presented group of the angiosperms with 35 families, 7 genera and 58 species, and 1 sup species, whereas Monocotyledons comprised far less diverse group of medicinal plants in the area study with only 6 families, 7 genera and 7 sup species, pteridophyta 1 family, 1 genus, 1 species. Aschers, belonging to the family Primulaceae are shown in Table (1). Two families Asteraceae and Lamiaceae represent the highest proportion of medicinal plants in terms of the number of genera and species 5,5 however, among the six biggest families in Libya (Aliand Jafri, 1977; Jafri and El-Gadi, 1986), followed by Fabaceae with 4 genera and 4 species. There is more than one family that is represented by one genus and one species. With 46 species, the Asteraceae family is dominated by Wadi Al-Ager (Alaib et al., 2016). With 130 species, it was the largest family in the Sedy Boras region (Alzerbi and Alaib, 2017) as well as in the Al-mansora region of Al-Jabal. Al-Akhdar (Abusaief and Dakhil, 2013).

Plants belonging to this family have a long history of being used as medicinal plants for the treatment of various diseases and are also used in the pharmaceutical and cosmetic industries. In addition, plants such as *Artemisia annua* have played an important role in the discovery of novel drugs (Devkota and Aftab, 2022). Asteraceae was recorded as the family with the highest number of endemic genera in Al-Jabal Al-Akhdar (El-Darier and Mogaspi, 2009). Overall, Asteraceae has been documented as the most dominant family in Libya, representing 237 species (Keith, 1965 & Feng et al., 2013). The Lamiaceae and Fabaceae families, are rich in medicinal plants and are of economic importance. The family Fabaceae is the third biggest family of angiospermae after Orchidaceae and Asteraceae in the world (Lewis et al., 2005). Our results revealed that the most represented life forms of the medicinal plants in Shahat were the rophytes (Th) (36%) 24 species, Phanerophytes (Ph) (18%), 12 species, Chamaephytes (Ch) (16%) 11 species, followed by Geophytes (G) (10%) 7 species, Heleophytes (H) and Nano-phanerophytes (7%) 5 species, as for Hemicryptophytes, Hydrophytes and Linaes the percentage of their presence was very simple (2%) it is represented by one type for each of them as are shown in Fig. 2 and Table (1). Also on the list is an endemic and endangered medicinal plant, *Cyclamen rohlfsianum* Aschers, belonging to the family Primulaceae as is shown in Fig. 1. We note here that most of the existing

plants are annual plants that can adapt to the high temperatures in the summer, and they represent the Mediterranean region, and this study is consistent with previous studies conducted in different regions of AL-jabal AL-Akhdar. This ecological spectrum is strikingly similar to that of other Mediterranean basin regions.

The percentage of the rophytes, the main life form, are well adapted to the summer because annuals complete their life cycle in a single season. The Mediterranean climate's frequent droughts and high temperatures, make up about 50% of the floristic composition present in the biome (Archibold, 1995). Similar findings were made by (El-Mokasabi, 2014), who found that Therophytes dominated (49%) Wadi Al-Kouf. Therophytes accounted for the highest percentage of all the valleys examined in Al-Jabal Al-Akhdar, it has been found. The percentage of medicinal plants contributions to the range of life forms in the four valleys of Al-Jabal Al-Akhdar that were studied is dominant (36%). In Shahat, Therophytes made up the largest portion of the spectrum of life-forms. The majority of checked areas, Al-Jabal Al-Akhdar's Wadi Zaza, Wadi Al Ager, Wadi Jar Jar Uma, and Wadi Ras Al-Hilal (Mukassabi et al., 2017), were in proximity to one another in the present study. These three taxa were primarily dominated by evergreen sclerophyllous shrubs that had the necessary morphological traits to withstand the dry summer conditions. In similar findings, Phanerophytes were the most dominant representing of the species found in Wadi Belkaf (Alaib et al., 2016).

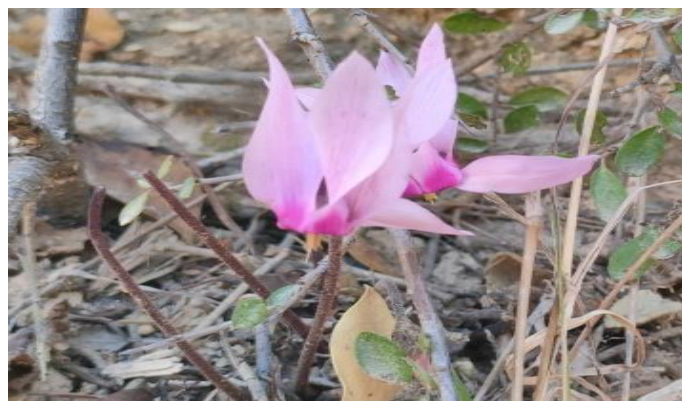


Fig .1. *Cyclamen rohlfsianum* Aschers.

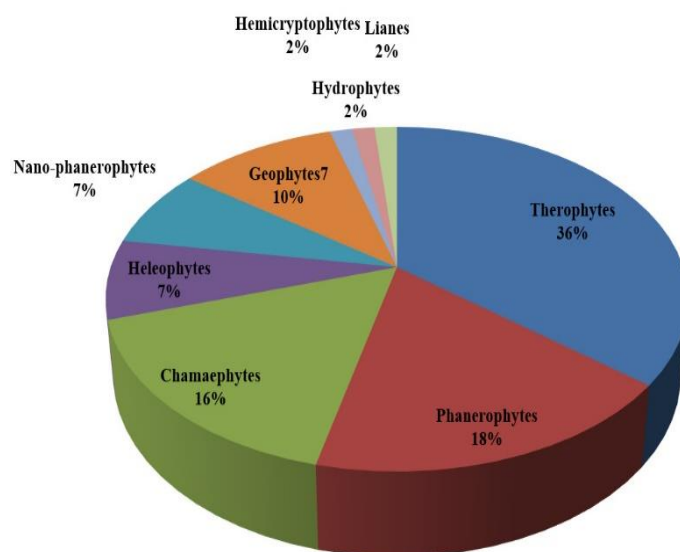


Fig .2. Life-form spectrum of medicinal plants in Cyrene (Shahat) Al-Jabal Al-Akhdar.

**Table 1**

List of medicinal plant species, recorded in Shahat, Al-Jabal Al-Akhdar, their life for and used part. For plant life-forms are: (Ch) Chamaephyte, (G) Geophyte, (H) Hemicryptophyte, Ph (Phanerophyte), Th (Therophyte).

	Family	Scientific name	Local name	Used part	Life Forms	References
1.	Adiantaceae	<i>Adiantum capillus-veneris</i> L.	Kazbarat albir	The whole overground	Hemi	<a href="#">Kotb, 1985</a>
2.	Anacardiaceae	<i>Pistacia lentiscus</i> L.	Batom	Leaves, seeds, fruits and the resinous juice known as mastic obtained from the inner bark.	Ph	<a href="#">Kotb, 1985</a>
3.	Alliaceae	<i>Allium roseum</i> L.	Ghazul	Leaves, Flower and Bulbs.	G	<a href="#">El-Gadi and Maghribi, 1999</a>
4.	Amaryllidaceae	<i>Narcissus elegans</i> (Haw.) Spach.	Nargis	Bulbs	G	<a href="#">Medicinal, 2008</a>
5.	Apocynaceae	<i>Nerium oleander</i> L.	Defla	The glycosides Obtained from the whole plant.	N.Ph	<a href="#">Kotb, 1985</a>
6.	Apiaceae	<i>Ammi majus</i> L.	Svanari bhaim	Fruits.	Th	<a href="#">Kotb, 1985</a>
7.		<i>Foeniculum vulgare</i> Philip Miller.	Shamr, Kamun earid	The herb and the volatile oil obtained from the fruits.	G	<a href="#">Kotb, 1985</a>
8.		<i>Thapsia garganica</i> L.	Dryas	Oil.	Ch	<a href="#">Mokasabi, 2014</a>
9.	Arecaceae	<i>Phoenix canariensis</i> Chaub.	Nakhel Faron	Fruits and Pollen.	Ph	<a href="#">Medicinal, 1988</a>
10.	Asteraceae	<i>Chrysanthemum coronarium</i> L.	Aloghwan	Leaves, flowers, seeds.	Th	<a href="#">El-Gadi and Maghribi, 1999</a>
11.		<i>Helichrysum stoechas</i> (L.) Moench.	Esushbat al arnab	Stems, Leaves, and Flowers.	Ch	<a href="#">El-Gadi and Maghribi, 1999</a>
12.		<i>Phagnalon rupestre</i> (L.) DC.	Esushbat al arnab	The whole herb.	Ch	<a href="#">Kotb, 1985</a>
13.		<i>Sonchus oleraceus</i> L.	Tefaf	The entire herb.	Th	<a href="#">Kotb, 1985</a>
14.		<i>Xanthium spinosum</i> L.	--	Leaves, fruits and Root.	Th	<a href="#">Acsad, 2012.</a>
15.	Boraginaceae	<i>Borago officinalis</i> L.	Lesan Althawr	Flowers and Leaves.	Th	<a href="#">Kotb, 1985</a>
16.	Brassicaceae	<i>Nasturtium officinale</i> R.Br.	Rashad	The tender flowering aerial parts.	Hy	<a href="#">Acsad, 2012.</a>
17.		<i>Sinapis alba</i> L.	Khardal	Seeds	Th	<a href="#">Kotb, 1985</a>
18.	Cactaceae	<i>Opuntia ficus-indica</i> (L.) Mill.	Karmos	Fruits and stems.	-	<a href="#">Kotb, 1985</a>
19.	Caesalpinaceae	<i>Ceratonia siliqua</i> L.	Carob	Fruits known as pods and gum obtained from the endosperm of the seed.	Ph	<a href="#">Kotb, 1985</a>
20.	Campanulaceae	<i>Campanula erinus</i> L.	--	Leaves and Roots.	Th	<a href="#">Medicinal, 2008</a>
21.	Capparaceae	<i>Capparis spinosa</i> L.	Kabbar	Over – ground parts.	H	<a href="#">Kotb, 1985</a>
22.	Caprifoliaceae	<i>Lonicera etrusca</i> Santi.	--	Leaves	Li	<a href="#">Mokasabi, 2014</a>
23.		<i>Viburnum tinus</i> L.	--	Fruits.	Ph	<a href="#">Mokasabi, 2014</a>
24.	Covulvulaceae	<i>Convolvulus althaeoides</i> L.	Ullak	Leaves and flowering branches	H	<a href="#">Medicinal, 1988</a>
25.	Cupressaceae	<i>Cupressus sempervirens</i> ver. (Mill.) Gordon	Al-sarow	Cones, wood and Fruits.	Ph	<a href="#">Kotb, 1985</a>
26.		<i>C. sempervirens</i> L. ver. <i>Sempervirens</i>	\\	\\	Ph	\\
27.	Ephedraceae	<i>Ephedra alata</i> Desf.	Alanda	The entire herb.	Ch	<a href="#">Kotb, 1985</a>
28.	Euphorbiaceae	<i>Euphorbia peplus</i> L.	Lebbena	Lactic juice.	Ch	<a href="#">Medicinal, 1988</a>
29.		<i>Mercurialis annua</i> L.	Halbob	Herb	Th	<a href="#">Kotb, 1985</a>
30.		<i>Ricinus communis</i> L.	Kharwa	The entire planted and fixed oil expressed from the seed.	N.Ph	<a href="#">Kotb, 1985</a>
31.	Fabaceae	<i>Anagyris foetida</i> L.	Kharroub El-Klab	Leaves, Seeds	Ph	<a href="#">Medicinal, 2008</a>
32.		<i>Lathyrus aphaca</i> L.	Bega	Ripe seeds.	Th	<a href="#">Kotb, 1985</a>
33.		<i>Ononis spinosa</i> L.	Shdida	Flowers and roots.	H	<a href="#">Kotb, 1985</a>
34.		<i>Robinia pseudoacacia</i> L.	Chagarat Al-garad	Flowers	Th	<a href="#">Kotb, 1985</a>

35.	Fumariaceae	<i>Fumaria capreolata</i> L.	--	The whole plant without theroots.	Th	Kotb, 1985
36.	Geraniaceae	<i>Geranium molle</i> L.	--	The entire plant without the roots.	Th	Kotb, 1985
37.		<i>G. robertianum</i> L.	\\	\\	Th	\\
38.	Illecebraceae	<i>Paronychia arabica</i> (Linn.) DC.	Tifan	All part of plant	Th	El-Gadi, 1989
39.	Iridaceae	<i>Iris germanica</i> L.	Kaab teeb	Rhizomes obtained in the autumn.	G	Kotb, 1985
40.	Lamiaceae	<i>Ballota pseudo-dictamnus</i> (L.) Benth.	--	Shoot.	Ch	Mokasabi, 2014
41.		<i>Marrubium vulgare</i> L.	Rubina	All vegetative parts of the plant.	G	El-Gadi and Bishina, 1992
42.		<i>Micromeria nevosa</i> (Desf.) Benth.	--	Flowering plant.	Ch	Acsad, 2012.
43.		<i>Rosmarinus officinalis</i> L.	Kleel	Leaves and flowering tops.	N.Ph	Kotb, 1985
44.		<i>Stachys tournefortii</i> Poiret.	--	Leaves	Ch	Medicinal, 2008
45.	Lauraceae	<i>Laurus nobilis</i> L.	Ghar - Rand	Berries and leaves without petioles.	Ph	Kotb, 1985
46.	Liliaceae	<i>Urginea maritima</i> (L.) Baker.	Faroon	The bulbs.	G	Kotb, 1985
47.	Malvaceae	<i>Malva parviflora</i> L.	Khabiz	Leaves and seeds.	Th	Kotb, 1985
48.	Mimosaceae	<i>Acacia farnesiana</i> (L.) Willd.	Sweet Acacia	Bark, Fruits, Pods, Flowers, Leaves and gum.	Ph	Kotb, 1985
49.	Moraceae	<i>Ficus carica</i> L.	Karmus	Fruits and latex from the stems.	Ph	Kotb, 1985
50.	Myrtaceae	<i>Eucalyptus gomphocephala</i> DC.	Kaphor	Leaves.	Ch	El-Gadi, 1989
51.	Oleaceae	<i>Olea europaea</i> L.	Zaitoon	Fruits, Fixed oil obtained from it, bark and leaves.	Ph	Kotb, 1985
52.	Papaveraceae	<i>Papaver rhoeas</i> L.	Zeghalil	Petals.	Th	Kotb, 1985
53.	Pinaceae	<i>Pinus halepensis</i> Mill.	Senouber	Cones and seed	Ph	Kotb, 1985
54.	Polygonaceae	<i>Polygonum equisetiformis</i> Sibth and Sm.	Elqardab	The whole plant.	H	Kotb, 1985
55.	Primulaceae	<i>Anagallis arvensis</i> L. var <i>arvensis</i>	Ain Algatuus	Whole herb	Th	Kotb, 1985
56.		<i>Anagallis arvensis</i> L. caerulea (L.) Gouan	\\	\\	Th	\\
57.		<i>Cyclamen rohlfsianum</i> Aschers.	Rakaf	Leaves, Tuberous	G	Mokasabi, 2014
58.	Pouaceae	<i>Hordeum murinum</i> L.	Zewan	Grain	Th	Medicinal, 2008
59.		<i>Lolium multiflorum</i> Lam.	--	Seeds.	Th	Medicinal, 2008
60.	Urticaceae	<i>Urtica pilulifera</i> L.	Horeg	Leaves.	Th	Medicinal, 1988
61.	Ranunculaceae	<i>Adonis microcarpa</i> DC.	Ain el buma	A plant without roots.	Th	Medicinal, 2008
62.	Rhamnaceae	<i>Rhamnus alateinus</i> ssp <i>alateinus</i> L.	Selluf	Bark	N.Ph	Kosalec et al., 2013
63.	Rubiaceae	<i>Galium aparine</i> L.	--	The flowering tops	Th	Kotb, 1985
64.	Rosaceae	<i>Prunus amygdalus</i> Batsch.	Lawaz	Fruits	-	Kotb, 1985
65.		<i>Rosa deseglisei</i> Boreau.	El warad	Flowers just before they open, Petals, Leaves, Seeds.	-	Gadi, 1985
66.	Scrophulariaceae	<i>Verbascum sinuatum</i> L.	--	Roots, Leaves, Roots.	Ch	Medicinal, 1988
67.	Solanaceae	<i>Datura innoxia</i> Mill.	Datura	Leaves and Flowers	Ch	El-Gadi, 1989
68.		<i>Nicotiana glauca</i> Graham.	Akuz musa	Leaves and overground parts.	N.Ph	Kotb, 1985
69.		<i>Solanum nigrum</i> var <i>nigrum</i> L.	Enab -Al-deib	Ripe leaves and Fruits.	Th	Kotb, 1985
70.	Verbinaceae	<i>Verbena officinalis</i> L.	--	The whole flowering plant.	H	Kotb, 1985

#### 4. Conclusions

Al-Jabal Al-Akhdar is considered one of the most important areas because of its vegetation rich in medicinal plants and endemic plants that are not found anywhere else, and there are many plants threatened with extinction due to urban expansion, overgrazing, forest fires, and unjust cutting of trees, so we must strive to create natural reserves for

medicinal plants and endangered plants, As well as establishing a seed bank to preserve plants, especially medicinal plants that are threatened with extinction.

#### References

Abusaief, H.M., Dakhil, A.H. (2013) The floristic composition of rocky habitat of Al-Jabal Al-Akhdar, Libya. *New York Science Journal*, 6(5), pp. 34–45.



- Alaib, M.A., Elbakkosh, A.M., Abdulati, Y.B., Gadelmola, A.S., Elmhafdi, A.M. (2016) 'Preliminary investigation of the vegetation of Wadi Belkaf-Bata, Al-Jabal Al-Akhdar', *Libyan Journal of Science & Technology*, 4(1), pp. 20–27.
- Ali, S.I., Jafri, S.M. (1977) *Flora of Libya*. Tripoli (Libya) Department of Botany, Faculty of Science, Tripoli University (formerly Al-Fateh University Vols. 1–24.
- Alzerbi, A., Alaib, M., (2017) 'Study of vegetation in Sedy Boras's region in Al-Jabal Al-Akhdar-Libya', *Journal of Environmental Science and Engineering*, 1(1), pp. 67–72.
- Archibold, O.W. (1995) *Ecology of world vegetation*. Chapman and Hall. London.
- Clayman, D. (2014). *Berenice II and the Golden 1 chronologies*. *Libyan Studies*, 36:20 - Age of Ptolemaic Egypt. Oxford University Press, (3), pp. 15-20.
- Devkota, H.P. (2022) An Overview of Medicinal Plants of the Asteraceae Family and Their Role in Human Health. *Medicinal Plants of the Asteraceae Family: Traditional Uses, Phytochemistry and Pharmacological Activities*, Vols 1-15.
- Elbah, S. (2002) An evaluation of environmental impact assessment within the planning process in Libya and the UK in relation to cement manufacture. Sheffield Hallam University (*United Kingdom*), Vols. 19-37.
- El-Darier, S.M., and El-Mogaspi, F.M. (2009) Ethnobotany and relative importance of some endemic plant species at El-Jabal El-Akhdar Region (Libya). *World Journal of Agricultural Sciences*, 5(3), 353-360.
- El-Gadi, A. and Bishina, S. (1992). Usages of some plants in Libyan folk medicine. I. *Dar Al-Kutub*. Benghazi, Libya.
- El-Gadi, A. and El-Mughrabi, M. (1999). Usages of some plants in Libyan folk medicine. III. *Dar Al-Hekma*. Tripoli, Libya.
- El-Gadi, A. (1989). Usages of some plants in Libyan folk medicine. II. *Dar Al-Kutub*. Benghazi, Libya.
- El-Mokasabi, F. (2014) 'The State of the Art of Traditional Herbal Medicine in the Eastern Mediterranean Coastal Region of Libya', *Middle East J Sci Res*, 21(4), pp. 575-582.
- Feng, Y., Lei, J., Xu, X., Pan, B. (2013) Composition and characteristics of Libya flora. *Archives of Biological Sciences*, 65(2), pp. 651–657.
- Jafri, S.M., El-Gadi, A. (1986) *Flora of Libya*. Department, Faculty of Sci., Tripoli Univ., Libya .Vols. 25–144.
- James, P. (2005) 'Archaic Greek colonies in Libya: historical vs. archaeological chronologies', *Libyan Studies*, 36, pp. 1-20.
- Keith, H.G. (1965) A preliminary checklist of Libyan flora. Government of the Libyan Arab Republic, *Ministry of Agriculture and Agrarian Reform*, Tripoli. Libya, Vols. 1 - 2.
- Kosalec, I., Kremer, D., Locatelli, M., Epifano, F., Genovese, S., Carlucci, G., and Končić, M. Z. (2013). Anthraquinone profile, antioxidant and antimicrobial activity of bark extracts of *Rhamnus alaternus*, *R. fallax*, *R. intermedia* and *R. pumila*. *Food chemistry*, 136(2), 335-341.
- Kotb, F. T. (1985). *Medicinal plants in Libya*. Arab Encyclopedia House, Beirut, Lebanon.
- Lewington, A. (1993) A Review of the Importation of Medicinal Plants and Plant Extracts into Europe. *TRAFFIC International, Cambridge* (63), 37.
- Lewis, G., Schire, B., Mackinder, B. and Lock, M. (2005) *Legumes of the World*, *Roy Bot Gard Kew*, P. 577.
- Medicinal, A. O.A.D. (1988) Aromatic and poisonous plants in the Arab World. Arab Organization for Development and Agriculture, P. 477.
- Medicinal, A.O.A.D. (2008) Aromatic and poisonous plants in the Arab World. Arab Organization for Development and Agriculture, P. 315.
- Mukassabi, T. A., Thomas, P. A., and Elmogasapi, A. (2017) 'Medicinal plants in Cyrenaica, Libya: existence and extinction', *Biyolojik Çeşitlilik ve Koruma*, 10(2), pp. 183-192.
- Robinson, E.S.G. (1927) Catalogue of the Greek coins of Cyrenaica. *Order of the Trustees*, 47(1), 145.
- Salmerón-Manzano, E., Garrido-Cardenas, J. A., and Manzano-Agugliaro, F. (2020) 'Worldwide research trends on medicinal plants', *International journal of environmental research and public health*, 17(10), e3376.
- Sofowora, A., Ogunbodede, E., and Onayade, A. (2013) 'The role and place of medicinal plants in the strategies for disease prevention', *African journal of traditional, complementary and alternative medicines*, 10(5), pp. 210-229.
- Srivastava, J., Lambert, J., and Vietmeyer, N. (1996) *Medicinal plants: An expanding role in development World Bank Publications*, P. 320.
- The Arab Center for Studies of Arid Zones and Dry Lands (Acsad). (2012) Atlas of medicinal and aromatic plants in the Arab world, *Arab countries University*, Damascus., Syria. P.629.