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## Survey of endangered plants and description the seeds in some sites at Al-Jabal Al-Akhdar of Libya

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### ABSTRACT

Consider inventory of endangered plants and the collection of accurate data it around, the important things that are considered indispensable in order to conserve plant wildlife in general. Having been in the study of endangered plants set in some of the Al- Jabal Al- Akhdar areas, depending on the information taxonomic and environmental available, review various and the results of botanical surveys of species and field studies, as well as guided by the standards adopted by the International Union for Conservation of Nature (IUCN) and that judgment assesses vegetation type it is threatened, and it includes life forms, frequency and density, endemic, areas where the distributed species, and the number of endangered species. There are 27 rare species of flowering plants represented by 25 genera, 20 families and 16 orders. In only endemic taxa two of rare species were *Teucrium apollinis* (Maire&Weiller.) and *Sedum bracteatum* (Viv., Fi.) found one species extinct in Shahat old city follows a family Amaryllidaceae to *Narcissus tazetta* (L.) while, in Shahat old city four families are critically endangered belong to Ephedraceae such as *Ephedra alata* (Decne.) Apiaceae such as *Foeniculum vulgare* (Mill. Fennel.), Lauraceae family content two species *Laurus azorica* (Seub.Franco) and *Laurus nobilis* (L.) another family Lamiaceae such as *Salvia fruticosa*(Mill.) in Belgara elevation 536 m. and later disappeared from the site.

**Key words:** Taxonomic, Rare species, Endangered plants

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### Introduction

It found five important plant areas in Libya and has been chosen important plant areas, which represents the coastline, mountains and desert region, with a focus on Al- Jabal Al- Akhdar, which is one of the largest important plant areas in Cyrenaica, which contain 80% of Libya's plants and are considered exceptional center of endemism (Al-Jabal Al-Akhdar south project, 2005 and Rodford *et al.*, 2011). Vegetation and forests declined from 500,000 ha ago 20 years to 180,000 ha due to forest fires and indiscriminate construction. Rare plants may be rare, in part, because they are more susceptible to damage by predispersal insect seed predators than widespread congeneric species; thus, seed predation may be an important determinant of plant rarity (Combs *et al.*, 2013). The botanical garden of the university of valencia collected 195 lots of seeds of the most characteristic plants of high mountain habitats for storage in a germplasm bank (Murphy, 2008). The possibility of exchanging information about species plants among the people and compile a database of information for the seeds to be a legacy for future generations.

Evaluate the population structure of twelve endangered species in Al-Jabal Al-Akhdar such as *Laurus nobilis* L. and *Thymus capitatus* L. (Mosallam *et al.*, 2017). Management plans should pay particular attention to the role of large and rare plants in human-dominated regions as their disappearance could disrupt forest succession to a climax state (Trolliet *et al.*, 2016). Composition and color of seed are characteristics that can play an important part in seed dispersion and predation, a structure seeds that can protect the seed from drying and predation (Camacho, 1994). The growing public concern about endangered plants is well founded. It is estimated that there are between 235,000 (Raven *et al.*, 1986) and 380,000 (IUCN, 2010) species of vascular plants in the world today; two-thirds of these species are found in the tropics (Raven *et al.*, 1986). The World Conservation Union (17 ; 18) currently lists 42,490 species (13.8% of the world's flora) as threatened, and 8903 species of

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plants (2.9% of the world's flora) as endangered. Threatened plants are found among 363 plant families in 294 countries. The U.S. 645 endangered species and 151 threatened species of flowering plants in the United States (U.S.) as of 7 October 2010. Unfortunately, many of the woody species face a wide array of threats, The Global Tree Seed Bank Project, is an important step in preserving the unique genetic resources (Kikodze, 2016). Because of the vulnerability plant species in Al- Jabal Al-Akhdar to degradation as a result of the negative vegetation practices and the loss of many of the important species and the scarcity of studies on rare species.

The main objective of the present work:

- 1- Identify and classify rare species to the study of fifteen spaced sites of the Al- Jabal Al- Akhdar.
- 2- Determination rare species of number in sites and number of sites which appears the species and compared to local and global previous studies.
- 3- The use of morphological traits to describe the seeds.

## The Study Area

### Location Description

The study area is located in the Mediterranean Sea Coast of Libya between latitude 32° 35' 52.84 " N and longitude 21° 28 ' 22 " E (Wikipedia, 2016).

Compilation of rare species of fifteen different natural sites of the Al- Jabal Al-Akhdar–Libya during seasons spring, summer, autumn and winter of 2014 to 2017 small letters is shown in Fig. 1.



**Fig. 1:** Study sites of Al- Jabal Al- Akhdar area located in the Mediterranean region of Libya (by Google earth).

### General Geology

Stratigraphy and surface geology of the exposed rocks in Al Jabal Al Akhdar area consist mainly of marine carbonate sedimentary units ranging in age from late Cretaceous to late Miocene. The tectonic and Structure geology of Al Jabal Al Akhdar regions represents the only mildly folded and faulted domal mountain chain in northern Libya. Unlike Libyan regions belonging to the Sahara

platform, this mountain chain is an isolated large area of high ground occupying much of Northern Cyrenaica (Hamad, 2012).

## **Soil**

The lime content of the sedimentary limestone of the area dissolves on weathering. The residue is a strongly calcareous clay, silty clay, clay loam or silty clay loam, which forms most important and common soil parent materials. Another important soil forming material is nummulitic limestone. Soils derived from these marly and chalky limestones contain high amounts of clay and CaCO<sub>3</sub> occupy minor areas (Hubert, 1964). As limestone soils, loamy to clay texture is dominant (Jahn *et al.*, 1989). In fact one of the most important physical properties of these soils is their clayey texture. In general, the soils of the Al Jabal Al Akhdar are developed on a highly calcareous parent material. They are shallow with Terra Rossa (ferrosiallitic red soil) predominant (Ben-Mahmood and Al-Jindeel, 1984).

## **Material and Methods**

### *Data Collection*

#### *Rare species*

Rare species study was undertaken during the period from 2014 to 2017 of all seasons were collected of some location in Al- Jabal Al-Akhdar of Libya (Figure 1). Area each site not less than 1 km<sup>2</sup>. The plant species of Al- Jabal Al-Akhdar were scored for the parameters of the rare species, according to IUCN 2001 ; Sapir *et al.*, 2003; FAO, 2006 ; Nikoli and Topi, 2005 and Milovi and Miti, 2012.

Least Concern (LC) 0.5%–0.1% of the area (11- 3 sites), Vulnerable (VU) 0.1%–0.05% of the area (3 -2 sites), Endangered (EN) 0.05%–0.01% of the area (2-1 sites), Critically Endangered (CR) 0.01% of the area (< 1 sites), Extinct (EX) 0.005% of the area, the species disappeared late in the sites. The presence of species in one site compared to the other 15 sites, and frequency and density of species in the squares studied.

Density (m<sup>-2</sup>) = (number of individuals ÷ area sampled), Frequency (plant/m<sup>2</sup>) = (number of sampled quadrates in which a species occurs ÷ total number of quadrates in the stand) according to (Abusaief, 2010).

#### *Standing Vegetation*

Conducted reconnaissance flights for three years to see rare species plants endangered and Experience germination in Al- Jabal Al-Akhdar region, was selection of sites based on elevation from sea level such as Slonta, SidiAlhamri (1), Ashnaishn, SidiAlhamri (2), Wadiralles (1), Habun (AinAlshallala), Shahat old city (AtharShahat) Cyrene, Balghara (1), Wadiralles (2), Balghara (2), Satiea, Al mansoura, Gandafora, Maibra and Alhamama (JabalAlosaita) fifteen elevations of 232 to 828 meters.

## **Sample collection**

The floristic categories and chorology of species recorded in the study area were made with their characteristic distribution terms, the plant life forms of the species were identified according to Jafri and El-Gadi, 1977-1993 and Boulos (1999, 2000, 2002 and 2005) and class, order, family, scientific name, bloomingtime, describe the life-forms present and endemic taxa were determined. All of the measurements were counted and scored within the 50 x 25 m<sup>2</sup> area for species trees and shrubs to survey the rare species quadrants were randomly selected within the 6 x 4 m<sup>2</sup> for species forbs and grass (Krebs, 1985). The plants observed within these quadrants were counted and determined to species.

## Experiment planning

Running mean method was used which includes throwing two points, then the average density of a rare species then take a third point, and calculates the average the same species density then take fourth point and calculates the average account and so on until we note that throwing extra points does not affect influence noticeable on the mean when the number placed points be enough to express the plant community, which dominated this species, named method point- Centered Quarter Methods (Andronov and Chinarova, 2014).

### *Describe the seed*

Examine the seeds with power zoom a using Microscope Olympus (SZX16) (Murphy, 2008)

### *Statistical analysis*

To analyze the data, we used a mixed model analysis of variance (ANOVA) and a generalized linear mixed model (GLMM) with binomial error to accommodate the hierarchical design. The GLMM looked at the main fixed effects of sites and characteristics, significant effects were compared using LSD test. Use the cluster design for the analysis of the variance between the sites to see the contrast the sites and precipitation rate at the level of significant  $\leq 0.05$ . The similarity coefficient between all sites and for different species within the same sites (Rohlf, 1993).

## Results and Discussion

Fifteen sites were studied from different area of Al - Jabal Al - Akhdar –Libya. Not all sites contain rare species despit the availability of other wild species, whereas six sites were not found rare species were Gandafora, Ashnaishn, Satiea, Alhamama (JabalAlosaita), Wadirels (1) and Sidi Alhamri (2). The sites differed in the distribution and number of rare species.

After the survey of the plants species in sites and applied density and frequency and criteria of scarcity, where we get from the main list of 115 species were 27 species rare at site study.

### A. Botanical composition of Rare species

Scientific classification were of all rare species were followed kingdom plantae and division Tracheophyta, Tables (1 - 9) shown the floristic analysis Class, order, family, scientific name, local name, blooming time and life forms of the recorded survey and classification for each rare species in some sites of Al- Jabal Al- Akhdar in 2014, 2015, 2016 and 2017 to March month. Figure 2 - 10 shows photos of rare plants, flower and seeds of each species in its environment. Rare plant species 28 species belong to 26 genera, 20 families and 16 orders. All rare plant species were Plant Kingdome, Division: Spermatophytes, Sub-Division Angiosperms except *Ephedra alata* Decne. was Division:Gnetophyta, Sub-Division Gymnosperms (Sherif and El-Taife, 1986 ; APG, 2003). In Mibra site were found two species rare species *Globularia alypum* (L.) and *Smilax aspera* (L.) are in accordance with Khlifi *et al.*, 2011 the genus *Globularia* consists of plants which are dwarf shrubs, chamaephytes (Table 1 and Fig. 3), common in the Mediterranean regions, Europe and North Africa (Tunisia, Morocco, Libya and Algeria). The hydromethanolic extract of *Globularia alypum* (L.) could thus be considered as a source of potential antioxidants. Also, in Mibra *Smilax aspera* L.this plant is found in previous studies in the book of Mediterranean plants (Rodford *et al*, 2011) and Flora of Libya, not found in Flora of Egypt. *Smilax* is a genus of about 300–350 species, found in the tropics and subtropics worldwide, found in Kew World Checklist, 2012 of Selected Plant Families.

*Narcissus tazetta* well-known species occurs from the Atlantic side of Portugal, thence around the Mediterranean on both European and African shores to China and Japan. Flowering occurs from late December to March (Meyer, 1961). Endemic taxa oneof rare species *Capparis spinosa* (Subsp. Orientalis) (El-Darier and El-Mogaspi, 2009). In flora of Libya only endemic taxa tow of rare species were *Teucrium apollinis* (Maire&Weiller.) and *Sedum bracteatum* (Viv., Fi). Constructing red

numbers for setting conservation priorities of endangered plant species: Israeli flora were found a rare species is defined when present in 0.5% of the area or less, among rare species *Potentilla reptans* L., *Veronica anagalloides* Guss. *Myrtus communis* L.(Mersin) (Sapir *et al.*, 2003). Nawash *et al.*, 2014 that *Salvia fruticosa* Mill was Blooming time in April, while, *Foeniculum vulgare* Mill was during February, March and April from the Mediterranean Forest in Northern Jordan, Mentioned Taifuor and El-Oqlah, 2014 that *Salvia fruticosa* regionally extinct and threatened to *Foeniculum vulgare* (Mill.). Consensus flowering date and seed set are in accordance with the Lebanese study to *Salvia fruticosa* Mill begins with at the woody base parts during early spring with the development of the tender shoots. Flowering is initiated during March-April. After which the plant shifts to slow growth without a secondary blooming wave under Mediterranean climate until the first significant rains of the autumn where the vegetative growth reaccelerate again. Seed set during May-June, this seasonality allows for one main harvest (GEF-UNDP-LARI, 2013).

## B. Description the seeds

The seeds of the twenty-seven plants were described and focus on the seeds that were not described in the mentioned references, 13 seeds were first described these seeds are: *Bupleurum gerardi* All., *Fumaria capreolata* L., *Globularia alypum* L., *Lonicera nummularifolia* Jaub., *Ptilostemon gnaphaloides* (Cyr.) Sojak, Novit., *Rubus sanctus* Schreber, *Salvia fruticosa* (Mill.), *Sedum bracteatum* (Viv., Fi.), *Sedum rubens* L., *Serratula cichoraceae* L., *Smilax aspera* (L.), *Thymus capitatus* L. Hoffm. & Link and *Valerianella muricata* (Steven ex M.Bieb.) W. Loudon.

*Globularia alypum* L. the seeds scurfy size 2-3 x 1 mm and covered with hirsute from the front. color is brown to pale black, callous, shaped ligule. Date of flowering: Blooming time April and date seeds was May.

*Smilax aspera* L., two seeds within each fruit each seed is surrounded by a transparent air bag, the color is brown pale and shiny, size 4-5 x 3 mm (0.5cm), spherical to circular, smooth, the fruit is red shiny and black when rip (Table 1 and Fig. 2).

**Table 1:** Class, Order, Family, Scientific name, Local name, Blooming time and Life forms in Mibra site.

No.	Order	Family	Scientific name	Local name	Blooming time	Life forms
1	Lamiales	PlantaginaceaeGlobulariaceae	<i>Globularia alypum</i> L.	Zerreiga	April –May	Ch., <15-25 cm high, Per., dwarf shrub
2	Liliales	SmilacaceaeLiliaceae	<i>Smilax aspera</i> L.	Rough	January or June-December	Ph., Per., climbing shrub

*Globularia alypum* L. species follow class dicotyledone, while *Smilax aspera* L. class monocotyledone. Ph = Phanerophytes, Ch= Chamaephytes, H= Hemicryptophytes, Th = Therophytes, Hy= Hydrophytes, G= Geophytes. Per. = Perennial, Ann. = Annual.



( 10x ) X 0.75 mm = 7.5

***Globularia alypum* L.**



( 10x ) X 0.75 mm =

***Smilax aspera* L.**

**Fig. 2:** Shows plants and seeds of *Globularia alypum* L. and *Smilax aspera* L.

Description seeds *Salvia fruticosa* (Mill.), the seed hispid thickness, green-colored, longitudinal black dark and shaped from circular to elliptical, and the seed hispid thickness, smooth of 3 – 4 x 2 mm.

**Table 2:** Order, Scientific name, Local name, Blooming time and Life forms in Belgara 1 site.

No.	Order	Scientific name	Local name	Blooming time	Life forms
1	Lamiales	<i>Salvia fruticosa</i> (Mill.)	Shai	11 April or May	Ch., dwarf shrub, Per.,



Fig. 3: Shows plants and seeds of *Salvia frutescens* Mill.

Description the seeds *Serratula cichoraceae* (L.) seeds tapering of 11-12 x 1.4 mm and its beginning hirtellous.

The seeds are longitudinal, narrow striped, the seeds are covered with hair and the upper part is smooth or pappus, seed is slightly arcuate

*Lonicera nummularifolia* (Jaub.) The fruit consists of two lobes each of which has a hole in the top, is covered with thick hair, each lobe has a seed and seeds of different sizes, its shape is like a money bag, ovate or semi-circular, colour brownish pale and the seed is polygonal, seeds 3-4 x 1.4 mm color brown and ribbed, seeds 11 x 1.1 mm white hirsute.

*Valerianella muricata* (Stiven ex M.Bieb.) W. Loudon,: The seeds are found inside a nail-like capsule, the color is castaneous and within it is a single soft "skinned seed", their color is pistachios, seeds small 0.09-1 x 0.4 mm size colorecastaneous.

*Thymus capitatus* L. Hoffm. & Link : The seeds are found inside a capsule covered with wrappers containing more than 6 seeds, shiny pink spots or punctate, smooth, rounded, brownish, size 0.65-1mm. (Table 3 and Fig. 4).

**Table 3:**Class, Order, Family, Scientific name, Local name, Blooming time and Life forms in Belgara 2 site.

No.	Order	Family	Scientific name	Local name	Blooming time	Life forms
1	Asterales	Asteraceae	<i>Serratula cichoraceae</i> L.	----	16 May or 1 May	Ch., Per., forbs
2	Dipsacales	Caprifoliaceae	<i>Lonicera nummularifolia</i> Jaub.	Jummet Fata	16 May	Ph., Per., tree
3	Dipsacales	Valerianaceae	<i>Valerianella muricata</i> (Stiven ex M.Bieb.) W.Loudon	---	11 April	Th., Ann., forbs
4	Lamiales	Lamiaceae	<i>Thymus capitatus</i> L. Hoffm. & Link	Zaatar	17 May	Ch., Per., shrub

Species follow class dicotyledone.



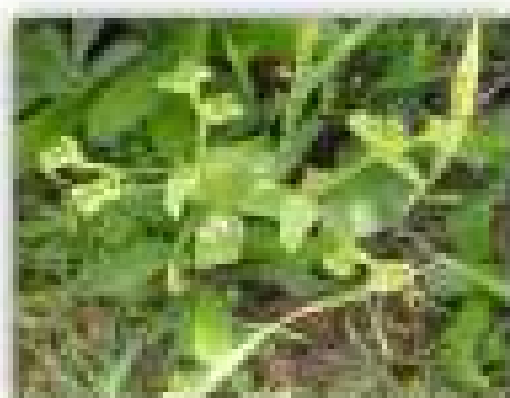
(10x) X 0.75 mm = 7.5

*Sesuvium portulacastrum* (L.) DC. ssp. *maritima* (L.)

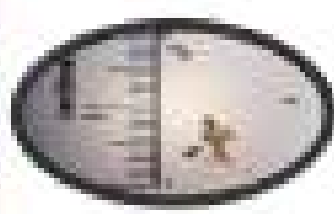


*Lactuca tatarica* (L.) Jostk.

(10x) X 0.75 mm = 7.5



*Lactuca tatarica* (L.) Jostk. & M. Richt. M. Ledeb.







(10x) X 0.75 mm = 7.5 mm

*Thymus capitatus* L. Hoff. & Link.

**Fig. 4:** Shows plants and seeds of *Serratula cichoraceae* (L.) *Lonicera nummularifolia*(Jaub.) *Valerianella muricata* (Stiven ex M.Bieb. .W. Loudon) and *Thymus capitatus*(L. Hoffm. & Link.)

Description the seeds *Putoria calabrica* (L. f.) DC: small seeds thin black and ribbed, smooth, membranous testa, size 1 -1 mm. Seed c. 5 x 1 mm, narrowly oblong, with brownish, membranous testa ( Jafri and El-Gadi, 1979). Number of seeds 1-2 seeds often (Blamey and Grey-Wilson, 2015).

**Table 4:**Class, Order, Family, Scientific name, Local name, Blooming time and Life forms in Al Mansoura site.

No	Order	Family	Scientific name	Local name	Blooming time/ Date seeds	Life forms
1	Gentianales	Rubiacea	<i>Putoria calabrica</i> (L. f.) DC.	----	17 May	Ch., Per., shrub
2	Lamiales	Lamiaceae	<i>Thymus capitatus</i> L. Hoffm. & Link	Zaatar	May	Ch., Per., shrub

*Species follow class dicotyledone.*



*Putoria calabrica* (L. f.) DC. (10x) X 0.75 mm=

**Fig. 5:**Shows plants and seeds of *Putoria calabrica* (L. f.) DC.

Description the seeds *Anagyris foetida* L. : Its seeds are black *purplish* with a black navel surrounded by a white aura, reniform, a large size of 0.5-1 x 0.25 cm located inside a pod with 2 – 6 seeds. Pods 8-14 x 1.2-2 cm, broadly linear, pendulous straight to arcuate, tapering at both end, acuminate, usually undulate at margin, glabrous, brownish; seeds 2-6 reniform, compressed, violet (Jafri and El-Gadi, 1980). Pod stalked, pendent, 100-200 mm long, hairless, somewhat constricted between the seeds (Blamey and Grey-Wilson, 2015).

*Myrtus communis* L. (Mersin) seeds very small 0.2 x 0.1 mm castaneous or creamy colour, light weight. The seeds are found inside a black capsule, its crown shape, and is the seeds numerous, reniform. Seeds reniform, 2.5-3 mm long, glossy, pale-brown or whitish, minutely rugulose (Jafri and El-Gadi, 1986).

*Fumaria capreolata* L. The glabrate rounded capsule is olive green seeds 1.5-2 x 1 mm size one seed is dark brown colour, shape from circular to oval. The upper side of the seed has a prominent trailing outside and the base has a navel.

*Rubus sanctus* Schreber.: The seeds are numerous, the shape of the cluster, colour is green, then red, and finally black, covered with a thin crust, and inside each lobe one seed, is light brown, the seeds have many wrinkles and cavities, size seeds 2.5-3 x 1.7 mm, 1-seeded carpels, each developing into a fleshy drupelet (Boulos, 1999).

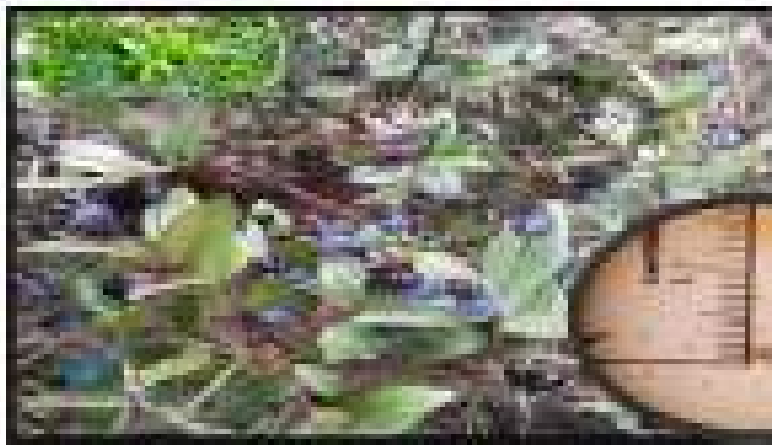
**Table5:** Class, Order, Family, Scientific name, Local name, Blooming time and Life forms in Habun site.

No.	Order	Family	Scientific name	Local name	Blooming time	Life forms
1	Fabales	Fabaceae	<i>Anagyrisfoetida</i> L.	Kharroub El-Klab	2 – 4	Ph., Per., shrub
2	Liliales	Smilacaceae/ Liliaceae	<i>Smilax aspera</i> L.	Rough	8 -12	Ph., Per., climbing shrub
3	<u>Myrtales</u>	Myrtaceae	<i>Myrtuscommunis</i> L.(Mersin)	Mersin	10 – 12	Ph., Per., tree
4	<u>Ranunculales</u>	Fumariaceae Papaveraceae	<i>Fumariacapreolata</i> L.	Sfinari El-Hamer	12 April	Th., Ann., forbs
5	Rosales	Rosaceae	<i>Rubus sanctus</i> Schreber	Tout Shouki	13-24 December	Ph., Per., shrub

*Species follow, class dicotyledone, except Smilax aspera (L.) class monocotyledone.*



***Anaavris foetida* L.**



*Hemiphragma*

(10x) X 0.75 mm = 7.5



*Amblyopone*

(10x) X 0.75 mm = 7.5  
mm



**Description the seeds**

*Teucrium apollinis* Maire et Weiller: We did not get seeds for this species and as stated in the reference it is rare fruit and thus get rare seeds, fruiting rarely (Jafri and EL-Gadi, 1985).

*Sedum rubens* L.: Seeds are very small and numerous, seeds 0.7-0.9 x 0.2 mm, glabrous, brownish, shiny, the seed has longitudinal lines, oval, the top is a little pointed, also, blooming time 11 April and date of appearance of the seed 16 May.

**Fig. 6:** Shows plants and seeds of *Anagyris foetida* L., *Myrtus communis* L. (Mersin), *Fumaria capreolata* L and *Rubus sanctus* Schreber.

**Table 6:** Class, Order, Family, Scientific name, Local name, Blooming time and Life forms in wadirels 2 site.

	Order	Family	Scientific name	Local name	Blooming time	Life forms
1	Lamiales	Lamiaceae	<i>Teucrium apollinis</i> Maire et Weiller	----	16 May	Ch., Per., shrub
2	Lamiales	Lamiaceae	<i>Thymus capitatus</i> L. Hoffm. & Link	Zaatar	17 May	Ch., Per., shrub
3	Saxifragales	Crassulaceae	<i>Sedum rubens</i> L.	----	11 April or 16 May	Th., Ann., forbs

*Species follow class dicotyledone*



***Sedum rubens* L.**

**Fig. 7:** Shows plants and seeds of *Teucrium apollinis*(Maire et Weiller) and *Sedum rubens* (L.).

Description seeds *Allium ampeloprasum* L.: Reproduction by separation of bulbs and seeds. The bulblets are the color of sugar to yellow shiny, capsule ovoid or subglobose, size 4-5mm. Seed production and by vegetative means since its bulbs produce many small bulblets (Boulos, 2005).

*Lonicera nummularifolia* (Jaub.): The fruit consists of two lobes each of which has a hole in the top, is covered with thick hair, each lobe has a seed and seeds of different sizes, its shape is like a money bag, ovate or semi-circular, seeds semi-circular, polygonal size seeds 3-5 x 1.5 mm, brownish pale. *Lonicera nummularifolia* (Jaub.) blooming time 1 May and date of appearance of the seed 16 May.

*Helianthemum Spp.*: Genus classified, the species not classified. The seeds are numerous inside a yellow capsule with thick hair on the base and the shape of the seed is a triangle whose base is wide from the bottom and a small extra is emerging from it. The top is slightly pointed, transparent and has corners, size 0.05- 0.07mm. Capsules ovoid, 3-valved, usually many seeded (Jafri and El-Gadi, 1977). Capsule, 3-valved; seeds small, angular; endosperm copious (Boulos, 2000).

**Table 7:** Class, Order, Family, Scientific name, Local name, Blooming time and Life forms in Sidi Alhamri (1) site.

	Order	Family	Scientific name	Local name	Blooming time	Life forms
1	Asparagales/Liliales	Alliaceae/ Amaryllidaceae	<i>Allium ampeloprasum</i> L.		26 April	Per., Grass G.,
2	Dipsacales	Caprifoliaceae	<i>Lonicera nummularifolia</i> Jaub.	Jummet Fata	1 May or 16 May	Ph., Per., tree
3	Malvales	Cistaceae	<i>Helianthemum Spp.</i>		1 May	Ch., Per., shrub

*Species follow, class dicotyledone, but Allium ampeloprasum class monocotyledone.*

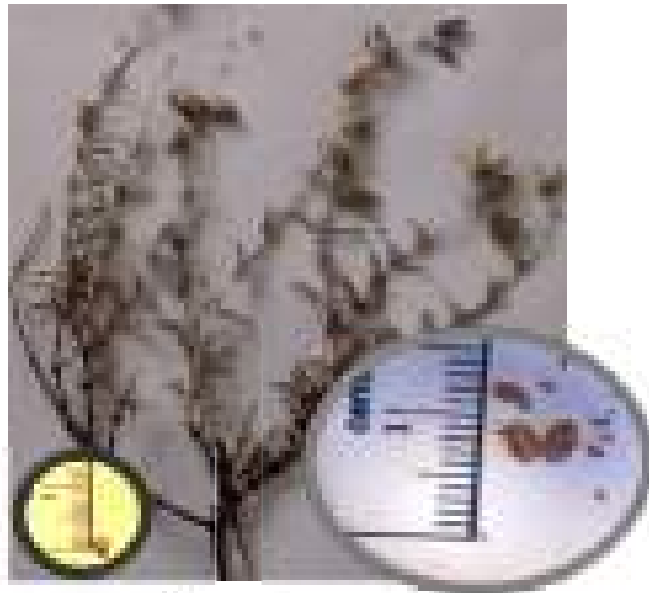


*Allium ampeloprasum* L.

( 10x ) X 0.75 m m = 7.5



***Lonicera nummularifolia* Jaub.** (10x) X 0.75 mm = 7.5 mm



***Helianthemum* spp.**

Description the seeds: *Sedum ebracteatum* (Viv.). Seeds are very small and numerous, color light brown, glabrous, end thin, size 0.74 x 0.15 mm, end thin. Blooming time 29 March and date of appearance of the seed 3 August.

**Fig. 8:** Shows plants and seeds of *Allium ampeloprasum* L., *Lonicera nummularifolia* Jaub. and *Helianthemum* Spp.

**Table 8:** Class, Order, Family, Scientific name, Local name, Blooming time and Life forms in Slonta site.

No.	Order	Family	Scientific name	Local name	Blooming time	Life forms
1	Saxifragales	Crassulaceae	<i>Sedum ebracteatum</i> Viv.		29 March or 3 August	Ch., Per., forbs

*Species follow, class dicotyledone*



Fig. 9. Shows plants and seeds of *Scalim abracceatum* VV.

Description the seeds Fig.10 *Foeniculum vulgare* (Mill. Fennel) the color of the seed is olive green, pale or brown, oblong or longitudinal, glabrous, septate, drawn edges, size 4-5 mm. Fruit oblong-ovoid 4-6 x 2-3 mm. Pale-greenish or brownish, glabrous; mericarps with 5, prominent obtusely carinate ribs (Jafri and El-Gadi, 1985). Umbels yellow, flattish, sweet-tasting (Blamey Marjorie and Grey-Wilson, 2015).

*Bupleurum gerardi* All: The fruit is fragmented, the seed unit of this fruit, glabrous, seeds rectangular 1-1.3 x 0.4 mm color dark brown it color is latency and finish is orange, septate to lines.

*Narcissus tazetta* (L.) Seeds reproduce with bulbs and seeds. Due to the lack of plant presence or absence in the studied area and not follow the stages of his life accurately, we did not get the seeds. Seeds subglobular, black (Jafri and El-Gadi, 1978). Capsule oblong-trigonal, rugulose; seeds, irregularly angular, rugulose, black (Boulos, 2005).

*Ptilostemon gnaphaloides* (Cyr.) Sojak,Novit.: The seeds airplane, a light seeds 3-4.5 x 2 mm end of hirtellous, while, seeds glabrous, cuneate or infundibular or oval shape, the lower ruminant it's color is brown and the upper comose, it's color is white.

*Capparis spinosa* Linn.Ssp.orientalis (Duh.) var. orientalis.: Size 2.2-3 x 2 mm the seed is kidney, light orange - light brown- dark brown, glabrous with more than 20 seeds found inside the capsule hanging from the stem, reniform. Fruit gynophores many seeded (Ali and Jafri, 1977). Fruit pyriform; seeds numerous (Boulos, 1999). Fruit large and berry-like, green or yellowish (Blamey and Grey-Wilson, 2015).

*Ephedra alata* (Decne.): Color seed is from yellow to light brown, oval, toriose, husky, and seed size from 1.5-2 x 0.8 mm yellowish bracts, with membranous and wavy, wing-like margin, seeds ovoid, acuminate (Sherif and El Taiffe, 1986). Female cones 2-seeded, bract with broad scarious margins at maturity (Boulos, 1999).

*Veronica anagallis* Aquatica L.: The seeds very small 0.3-0.5 x 0.2 mm size and are numerous found inside a circular capsule, color dark brown, glabrous. Seeds many somewhat oblong 0.5-1 x 0.4-0.5 mm (Jafri and El-Gadi, 1982). Seeds compressed, yellowish-brown (Boulos, 2002). Capsules rounded to elliptical, slightly notched, hairless (Blamey and Grey-Wilson, 2015).

*Laurus azorica* (Seub.) Franco: The fruit is semi-circular and its color is yellow to brown and has a hold in inside two seeds. Out spurious fruit. In this type of laurel, the plant was collected at all



stages of its growth. However, despite numerous attempts, we did not obtain the seed, the reason is that the tree had branches that were very high on the ground about 1.5 meter, we found single-sex "male". The plant has the characteristic of polygamous.

*Laurus nobilis* (L.): Seeds were not obtained. Fruit ovoid 10-15 mm, black when ripe (Jafri and El-Gadi, 1977). Fruit an oval berry black when ripe (Blamey and Grey-Wilson, 2015). There is an important note about the laurel, it seems to thrive well in Gebel Akhdar area, while Keith (l.c.) considered it to be extinct from our area (Jafri and El-Gadi, 1977).

*Laurus nobilis* (L.) and *Laurus azorica* (Seub.) Franco of the rare species in Al- Jabal Al-Akhdar The approach of some species of extinction in Al- Jabal Al- Akhdar (ACSAD, 1984 ; Al Zany, 1996 and Al-Jabal Al-Akhdar south project, 2005).

*Potentilla reptans* L.: Seeds of 1-1.5 x 0.65 mm size and kidney smooth glabrous, fruit achen, contains one seed, color olive green shiny or oleaginous, oval, go out of one of its sides ligule.

**Table 9:** Class, Order, Family, Scientific name, Local name, Blooming time and Life forms in Shahat old city (Cyrene) site.

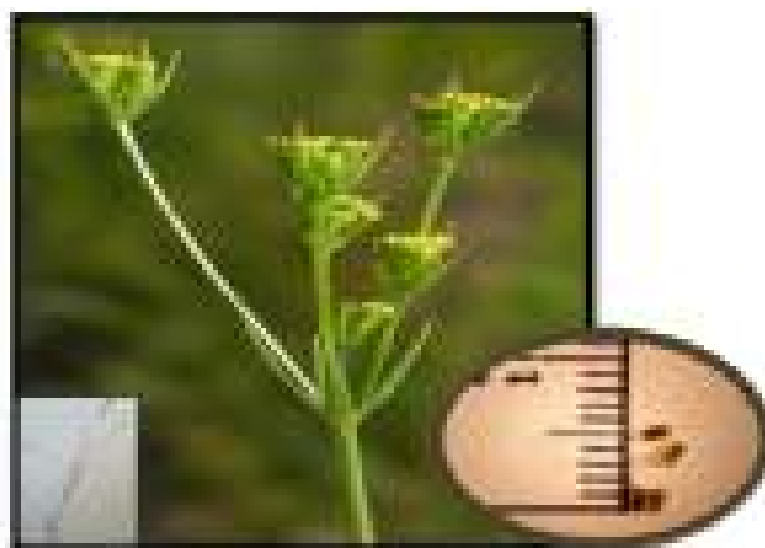
No.	Order	Family	Scientific name	Local name	Blooming time	Life forms
1	Apiales	Apiaceae	<i>Foeniculum vulgare</i> Mill. Fennel	Shamar	24 September or 7 February	H., Per., forbs
2	Apiales	Apiaceae	<i>Bupleurum gerardi</i> All.			Th., Ann., herb
3	Asparagales	Amaryllidaceae	<i>Narcissus tazetta</i> (L.)	Nargis	7 February	G., Per., grass
4	Asterales	Asteraceae	<i>Ptilostemongnaphaloides</i> (Cyr.) Sojak, Novit.		30 May or 7 February	Ch., Per., dwarf shrub
5	Capparales/ Brassicales	Capparaceae	<i>Capparis spinosa</i> Linn. Ssp. <i>orientalis</i> (Duh.) var. <i>orientalis</i> .	Kabbar	30 May or 11 July	Ph., Per., shrub
6	Ephedrales	Ephedraceae	<i>Ephedra alata</i> Decne.	Alendi	February or 19 January	Ch., Per., shrub
7	Lamiales	Scrophulariaceae	<i>Veronica anagallis</i> A. Quatica L.		2-3 or 28 April	Hy., Per., forbs
8	Laurales	Lauraceae	<i>Laurus azorica</i> (Seub.) Franco	Ghar-Rand	12 April or 7-11	Ph., Per., tree
9	Laurales	Lauraceae	<i>Laurus nobilis</i> L.	Ghar-Rand	7 February	Ph., Per., tree
10	Rosales	Rosaceae	<i>Potentilla reptans</i> L.		6-11 / 7 February and 30 May	H., Per., forbs
11	Rosales	Rosaceae	<i>Rubus sanctus</i> Schreber.	Tout Shouki	13 December or 3 August	Ph., Per., shrub

All rare plant species were plant kingdom, Division: Spermatophytes, Sub-Division Angiosperms except *Ephedra alata* (Decne.) was Division: Gnetophyta Sub-Division Gymnosperms, species follow, class dicotyledone, except *Narcissus tazetta* (L.) class monocotyledone, and *Ephedra alata* Gnetopsida.



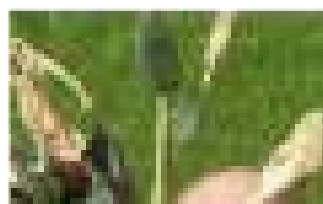
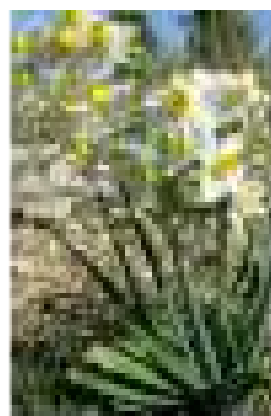
*Fraxinus vulgaris* Mill. Fernald.

(10x) X 0.85 mm = 8.5 mm



*Baptisia germanica* Boiss & Spruner.

(10x) X 0.75 m = 7.5 mm



*Narcissus tazetta* L.



*Pteleocoma gaeophytoides* (Cyc.) Sojak, Novil. (10X) X 0.75  
m m= 7.5 mm



*Capparis spinosa* Linn. ssp. *orientalis* (Muhl.) var. *orientalis*

(10x) X 0.75 mm =  
7.5 mm



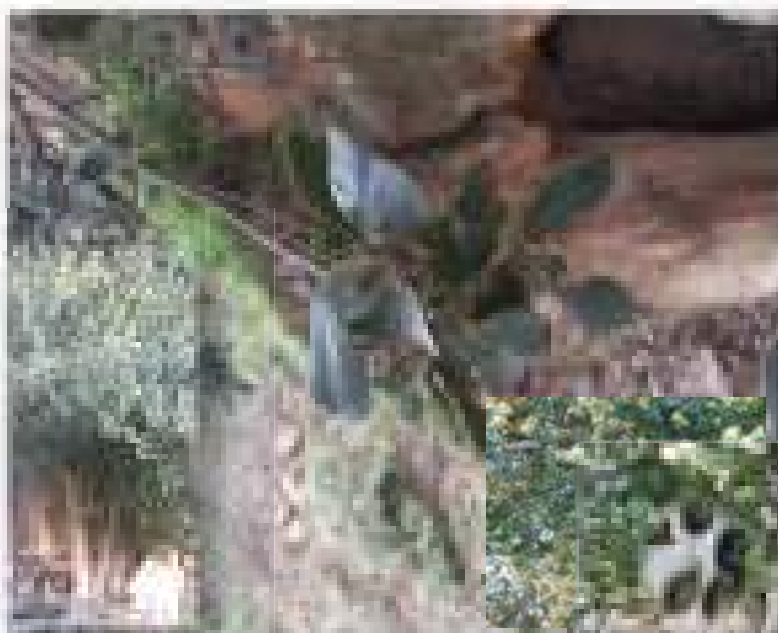
*Ephedra alata* Decne.

(10x) X 1.25 mm =  
12.5 mm

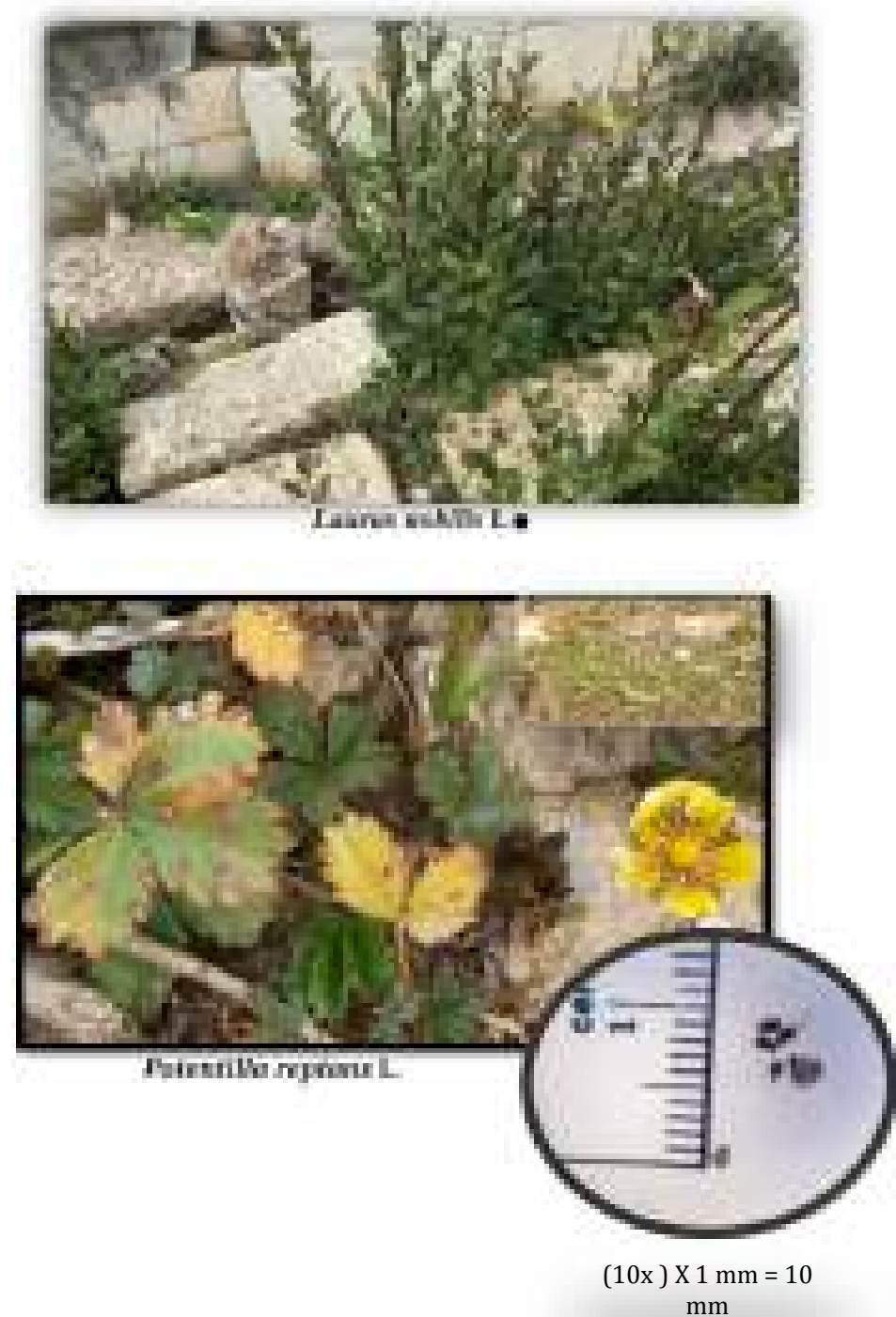


( 10x ) X 0.85 mm = 8.5 mm

***Veronica anagallis***  
***Aquatica L.***



***Laurus azarica* (Seeds) (Frans)**



**Fig. 10:** Shows plant and seed of *Foeniculum vulgare* Mill. Fennel, *Bupleurum gerardi* All., *Narcissus tazetta* (L.), *Ptilostemon gnaphaloides* (Cyr.) Sojak, Novit., *Capparis spinosa* Linn. *Ssp. orientalis* (Duh.) var. *orientalis*., *Ephedra alata* Decne., *Veronica anagallis* Aquatica (L.), *Laurus azorica* (Seub.) Franco, *Laurus nobilis* (L.) and *Potentilla reptans* (L.).

### Plant density and frequency

Results in Table (10 - 17) represent the plant density and frequency in some sites in Al- Jabal Al Akhdar, plant density had minimum value in some species considered rare species plants, plant density 0.00041 plant/m<sup>2</sup> and frequency 0.01 plant also frequency exit the species in 15 sites.

**Table 10:** Density and Frequency of plant species recorded in Slonta site.

	Scientific name	St1	St 2	St 3	to 100 St	Density m <sup>-2</sup>	Frequency
1	(L.) <i>Helichrysum stoechas</i> Dum.-Courset	1	-	-	-	0.00041	0.01
2	<i>Ballota pseudo-dictamnus</i> L.Benth	3	-	-	-	0.00125	0.03
3	<i>Sedum ebracteatum</i> Viv. Fi.	6	-	-	-	0.0025	0.06

St. = Stand

**Table 11:** Density and Frequency of plant species recorded in Sidi Alhamri site.

No.	Scientific name	St 1	St 2	St 3	to 100 St	Density m <sup>-2</sup>	Frequency
1	<i>Thapsia garganica</i> Lag.	2	-	-	-	0.00083	0.02
2	<i>Tragopogon porrifolius</i> L.	1	-	-	-	0.00041	0.01
3	<i>Lonicera nummularifolia</i> Jaub. & Spach.	1	2	-	-	0.00125	0.03
4	<i>Lonicera etrusca</i> Santi.	1	-	-	-	0.00041	0.01
5	<i>Arbutus pavarii</i> Pamp.	1	1	1	-	0.00125	0.03
6	<i>Polygala aschersoniana</i> Chodat	1	-	-	-	0.00041	0.01
7	<i>Rubia tenuifolia</i> L.	2	-	-	-	0.00083	0.02
8	<i>Parentucellia latifolia</i> (L.) Caruel	1	-	-	-	0.00041	0.01
9	<i>Prasium majus</i> L.	1	-	-	-	0.00041	0.01
10	<i>Allium ampeloprasum</i> L.	1	-	-	-	0.00041	0.01
11	<i>Linum strictum</i> L. var. <i>spicatum</i> Pers	3	-	-	-	0.00125	0.03
12	<i>Fumana thymifolia</i> L. Spach	1	-	-	-	0.00041	0.01
13	<i>Helianthemum</i> spp.	4	-	-	-	0.00166	0.04
14	<i>Clematis cirrhosa</i> L.	1	-	-	-	0.00041	0.01
15	<i>Rhamnus alaternus</i> Sub Sps. <i>Pendulus</i>	1	-	-	-	0.00041	0.01

**Table 12:** Density and Frequency of plant species recorded in Habun site.

No.	Scientific name	St1	St 2	St 3	to 100 St	Density m <sup>-2</sup>	Frequency
1	<i>Arum cyrenaicum</i>	3	-	-	-	0.00125	0.03
2	<i>Apium nodiflorum</i>	1	-	-	-	0.00041	0.01
3	<i>Smyrnum olusatrum</i> (L.)	1	1			0.00083	0.02
4	<i>Phagnalon rupestre</i> L. Dc.	1	-	-	-	0.00041	0.01
5	<i>Centranthus calcitrapae</i> (L.) Dufresne	1	-	-	-	0.00041	0.01
6	<i>Arbutus pavarii</i> Pamp.	1	-	-	-	0.00041	0.01
7	<i>Anagris foetida</i> L. ,Sp.	1	-	-	-	0.00041	0.01
8	<i>Olea europaea</i> var. <i>oleaster</i> (Hoffmg. & Link) Dc.	1	1	-	-	0.00083	0.02
9	<i>Phillyrea latifolia</i> L.	1	1			0.00083	0.02
10	<i>Asparagus aphyllus</i> L.	1	-	-	-	0.00041	0.01

11	<i>Smilax aspera</i> L. Sp.	1	-	-	-	0.00041	0.01
12	<i>Myrtus communis</i> L.(Mersin)	1	1	-	-	0.00083	0.02
13	<i>Clematis cirrhosa</i> L.	2	1	-	-	0.00125	0.03
14	<i>Fumaria capreolata</i> L.	3	-	-	-	0.00125	0.03
15	<i>Rubus sanctus</i> Schreber	1	-	-	-	0.00041	0.01

**Table 13:** Density and Frequency of plant species recorded in wadi rels site.

No.	Scientific name	St 1	St 2	St3	to 100 St	Density m <sup>2</sup>	Frequency
1	<i>Scaligeria cretica</i> Mill	1	-	-	-	0.00041	0.01
2	<i>Phagnalon rupestre</i> L. Dc.	1	-	-	-	0.00041	0.01
3	<i>Tordylium apulum</i> L.	1	-	-	-	0.00041	0.01
4	<i>Teucrium barbeyanum</i> Aschers	1	-	-	-	0.00041	0.01
5	<i>Teucrium apollinis</i> Maire et Weiller	1	-	-	-	0.00041	0.01
6	<i>Thymus capitatus</i> L. Hoffm. & Link	1	-	-	-	0.00041	0.01
7	<i>Parentucellia latifolia</i> (L.) Caruel	1	-	-	-	0.00041	0.01
8	<i>Sedum rubens</i> L.	1	-	-	-	0.00041	0.01

**Table 14:** Density and Frequency of plant species recorded in Shahat old city (Cyrene) site.

No.	Scientific name	St 1	St2	St 3	to 100 St	Density m <sup>2</sup>	Frequency
1	<i>Arum cyrenaicum</i>	1	-	-	-	0.00041	0.01
2	<i>Bupleurum gerardi</i> All.	1	-	-	-	0.00041	0.01
3	<i>Foeniculum vulgare</i> Mill. Fennel	1	1	-	-	0.00083	0.02
4	<i>Smyrniolum olusatrum</i> (L.)	2	-	-	-	0.00083	0.02
5	<i>Narcissus tazetta</i> L.	1	-	-	-	0.00041	0.01
6	<i>Rumela cyrenaica</i> Beguinot	1	-	-	-	0.00041	0.01
7	<i>Echinops cyrenaicus</i> Durand	4	-	-	-	0.00166	0.04
8	<i>Ptilostemon gnaphaloides</i> Cyr.	1	-	-	-	0.00041	0.01
9	<i>Capparis spinosa</i> L. var. <i>krugeriana</i> (Pamp.) Gafri	2	-	-	-	0.00083	0.02
10	<i>Cyperus longus</i> L.	1	1	-	-	0.00083	0.02
11	<i>Lonicera nummularifolia</i> Jaub. & Spach.	1	-	-	-	0.00041	0.01
12	<i>Centranthus calcitrapae</i> (L.) Dufresne	2	-	-	-	0.00083	0.02
13	<i>Ephedra alata</i> Decne.	1	-	-	-	0.00041	0.01
14	<i>Ballota pseudo-dictamnus</i> L.Benth	1	5	1	-	0.00291	0.07
15	<i>Origanum cyrenaicum</i> Beg. et Vaccari	1	1	-	-	0.00083	0.02
16	<i>Prasium majus</i> L.	1	-	-	-	0.00041	0.01
17	<i>Veronica anagallis</i> Aquatica L., Sp.	1	1	1	-	0.00125	0.03
18	<i>Laurus azorica</i> (Seub.) Franco	1	-	-	-	0.00041	0.01
19	<i>Laurus nobilis</i> L.	1	1	-	-	0.00083	0.02
20	<i>Euphorbia charasis</i> L.	2	1	-	-	0.00125	0.03
21	<i>Platyclusus orientalis</i>	2	-	-	-	0.00083	0.02



	<i>Biota orientalis</i> (L.) Endl						
22	<i>Pinus halepensis</i> Mill	1	-	-	-	0.00041	0.01
23	<i>Cerinth major</i> L.	1	-	-	-	0.00041	0.01
24	<i>Fumaria macrocarpa</i> Parlato	1	-	-	-	0.00041	0.01
25	<i>Parietaria judaica</i>	1	-	-	-	0.00041	0.01
26	<i>Potentilla reptans</i> L.	1	1	-	-	0.00083	0.02
27	<i>Rhamnus alaternus</i> Sub Sps. Pendulus	1	1	1	-	0.00125	0.03
28	<i>Rhamnus lyciodes</i> L.	2	1	-	-	0.0125	0.03
29	<i>Rubus sanctus</i> Schreber	1	-	-	-	0.00041	0.01

**Table 15:** Density and Frequency of plant species recorded in Belgara site.

No.	Scientific name	St 1	St 2	St 3	St 4	to 100 St	Density m <sup>-2</sup>	Frequenc y
1	<i>Arum cyrenaicum</i>	1	-	-	-	-	0.00041	0.01
2	<i>Lagoecia cuminoides</i> L.	1	-	-	-	-	0.00041	0.01
3	<i>Scaligeria cretica</i> Mill	1	-	-	-	-	0.00041	0.01
4	<i>Torilis leptophylla</i>	-	-	-	-	-	0.00041	0.01
5	<i>Cicerbita haimanniana</i> (Ascher.) Beau	1	-	-	-	-	0.00041	0.01
6	<i>Helichrysum stoechas</i> (L.) Dum.- Courset	1	-	-	-	-	0.00041	0.01
7	<i>Serratula cichoraceae</i>	1	-	-	-	-	0.00041	0.01
8	<i>Lonicera nummularifolia</i> Jaub. & Spach.	1	-	-	-	<i>Lonicera caprifolium</i>	0.00041	0.01
9	<i>Lonicera etrusca</i> Santi.	1	-	-	-	<i>Lonicera xylostum</i>	0.00041	0.01
10	<i>Valerianella muricata</i> (Stiven ex M.Bieb.) .W. Loudon	1	-	-	-	-	0.00041	0.01
11	<i>Arbutus pavarii</i> Pamp.	1	1	1	-	-	0.00125	0.03
12	<i>Cyclamen rohlfsianum</i> Aschers.	1	1	1	1	-	0.00166	0.04
13	<i>Calicotome villosa</i> (Poir.) Link	1	-	-	-	-	0.00041	0.01
14	<i>Quercus coccifera</i> L.	2	3	1		-	0.00291	0.07
15	<i>Ballota psedo-dictamnus</i> L.Benth	1	-	-	1	-	0.00041	0.01
16	<i>Origanum cyrenaicum</i> Beg. et Vaccari	1	-	-	-	-	0.00041	0.01
17	<i>Parentucellia latifolia</i> (L.) Caruel	1	-	-	-	-	0.00041	0.01
18	<i>Olea europaea</i> var. oleaster (Hoffmg. & Link) Dc.	1	1	1	-	-	0.00125	0.03
19	<i>Phillyrea latifolia</i> L.	1	-	-	-	-	0.00041	0.01
20	<i>Salvia fruticosa</i> Mill.	1	1	-	-		0.00083	0.02
21	<i>Teucrium barbeyanum</i> Aschers	1	-	-	-	-	0.00041	0.01
22	<i>Thymus capitatus</i> L. Hoffm. & Link	1	-	-	-	-	0.00041	0.01
23	<i>Helianthemum</i> spp.	1	-	-	-	-	0.00041	0.01

24	<i>Rhamnus lyciodes</i> L.	1	-	-	-	-	0.00041	0.01
25	<i>Viola scorpiuroides</i> Coss.	1	-	-	-	-	0.00041	0.01

**Table 16:** Density and Frequency of plant species recorded in Al Mansoura site.

No.	Scientific name	St1	St 2	St3	to 100 St	Density m <sup>-2</sup>	Frequency
1	<i>Arum cyrenaicum</i>	3	-	-	-	0.00125	0.03
2	<i>Putoria calabrica</i> (L. f.) DC., Prodr.	1	-	-	-	0.00041	0.01
3	<i>Origanum cyrenaicum</i> Beg. et Vaccari	1	-	-	-	0.00041	0.01
4	<i>Thymus capitatus</i> L. Hoffm. & Link	1	-	-	-	0.00041	0.01
5	<i>Bellevalia sessiliflora</i> (Viv.) Kunth	3	-	-	-	0.00125	0.03
6	<i>Umbilicus horizontalis</i> Guss. DC.	3	-	-	-	0.00125	0.03
7	<i>Cuscuta epithimum</i> (L.) Murray	1	-	-	-	0.00041	0.01
8	<i>Viola scorpiuroides</i> Coss.	1	-	-	-	0.00041	0.01

**Table 17:** Density and Frequency of plant species recorded in Mibra site.

No.	Scientific name	St.1	St. 2	St. 3	to 100 St.	Density m <sup>2</sup>	Frequency
1	<i>Lonicera nummularifolia</i> Jaub. & Spach.	1	-	-	-	0.00041	0.01
2	<i>Arbutus pavarii</i> Pamp.	1	-	-	-	0.00041	0.01
3	<i>Calicotome villosa</i> (Poir.) Link	1	-	-	-	0.00041	0.01
4	<i>Ceratonia siliqua</i> L.	1	-	-	-	0.00041	0.01
5	<i>Quercus coccifera</i> L.	2	1	-	-	0.00125	0.02
6	<i>Teucrium barbeyanum</i> Aschers	9	-	-	-	0.00375	0.01
7	<i>Phillyrea latifolia</i> L.	2	-	-	-	0.00083	0.01
8	<i>Globularia alypum</i> Linn., Sp. Pl.	1	1	-	-	0.00083	0.02
9	<i>Smilax aspera</i> L. Sp.	1	1	1	-	0.00125	0.03
10	<i>Rhamnus lyciodes</i> L.	1	-	-	-	0.00041	0.01

## Conclusions

Fifteen sites studied to stand at rare species and seed bank. Because of the vulnerability plant species in Al- Jabal Al- Akhdar to degradation as a result of the negative vegetation practices and the loss of many of the important species and the scarcity of studies on rare species.

## Recommendation

This study recommends preserving the rare species in Al- Jabal Al- Akhdar from the risk of extinction. The study the rare species of Ras Al-Hilal, Ein Mara, Wadi Al-Kouf and Shalalat Darnah, due to the existence of rare and endangered species in these sites. For the difficulty of collecting seeds, it is advised to know when the seeds mature for each rare species and seed morphology for each species.

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