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Summer flora and annotated checklist of Jabel Nafousa, Libya

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Abstract

A survey of the vascular flora of Jabel Nafousa (Nafousa Mountain) was conducted during the summer of 2022. A total number of 94 different taxa representing 35 families, 83 genera, and 94 species of which 33 families, 81 genera, and 92 species belong to Angiosperms, and 2 families, 2 genera, and 2 species belong to Gymnosperms. This study has revealed that the family *Poaceae* represents the most sizable family in the region with 14 species followed by the family *Asteraceae* with 12 species, whereas, the families *Amaranthaceae*, *Fabaceae*, and *Zygophyllaceae* with 6 species each. The families *Brassicaceae*, *Lamiaceae*, and *Liliaceae* are represented with 5, 4, and 4 species respectively. Other families are represented with 1-3 species. The results of this survey showed that 3 species are worth consideration because they exist in dominant and their distribution in the area of study is very common, including *Hammada scoparia*, *Retama raetam*, and *Ziziphus lotus*. The dominance of such species indicates that the climate of the region varies between arid-semiarid due to scarcity of rainfall, and very hot conditions, especially in summertime. With the exaptation of the 3 dominant species, other species are found to be capable of competing with the extremely hot conditions of the region. The life forms of the collected species of Jabel Nafousa showed the dominance of Therophytes with 24 species followed by Chamaephytes with 22 species, Hemicryptophytes with 17 species, Nanophanerophytes with 12 species, geophytes with 10 species, and Phanerophytes with 9 species. The present study of the summer flora of Jabel Nafousa represents the first attempt of its nature. An annotated checklist of 94 species collected and identified with relevant synonyms, distribution, and life form spectrum is included.

Keywords: Summer Flora, Jabel Nafousa, Life forms, Chorotypes, Libya

Introduction

Jabel Nafousa represents a chain of rocky mountains that extends from the southeast of Tunisia to the east of Al-Khoms-Libya. The height of the chain is approximately 968 m. above the sea level, and it is located 276 km., Northwest of Tripoli (Capital). The region of Jabel Nafousa occupies an area of about 76.717 Km² that lies between 31° 51' N latitude & 11° 47' E longitude. Jabel Nafousa is bounded by Jifara Plain and Zawiyah to the North, Sirte and Jufra Oasis to the east, Nalut to the west, and Wadi Shati to the south (Fig. 1); it consists primarily of limestone formations with traces of ancient volcanic activity. One of the most striking features is the steep chalk cliffs that extend from the Tunisian border to the Mediterranean's southern shore (McColl, 2014). The climate of Jabel Nafousa follows the climate of the Mediterranean region which is cold & rainy in the winter, and hot & dry in the summer (EGA, 2010; Mahklouf, *et al.*, 2018).

The temperature in the North West region of Libya including Jabel Nafusa sees an average August temperature of 26.5C, but has on occasion been known to reach 44C. Nightfall in August sees a lowering to 18C. January registers the lowest temperature at an average of 10.2C, falling to an average of 3C overnight, precipitation is at its lowest in July and August when it registers 0mm of precipitation, rising to its highest level of 57mm in January, Humidity is considered high, with the average being 68%, the wind shows average speeds of between 15 and 23km per hour throughout the year (Libya weather-climate-geography, 2023). In general, the scarcity of rainfall makes the region arid- semiarid, such condition makes the flora of Jabel Nafousa poor with regard to its vast area.

This study was concerned mainly with the summer flora of the Jabel Nafousa region, which was conducted between June - August of 2022. The data about the flora of the Jabel Nafousa region is very poor due to the scarcity of floristic studies on the study area, and the absence of comprehensive data on the flora of Jabel Nafusa especially summer flora except for some fragmented regional studies, for example, the study of El-Ahmir *et al.*, (2020) on the flora of Sedrores Mountains in Gharyan district, and the study of; Mahklouf *et al.*, (2018) on the flora of Tarhuna; therefore this study is the first attempt to determine the summer flora of Jabel Nafousa, and to provide a comprehensive list of summer species related to the vegetation of the region.



Figure 1. Map of Libya showing the location of Jabel Nafousa and main cities

Material and methods

The present study is based on collecting plant species from the Jabel Nafousa region during the summer of 2022 (June-August). The collected species were then treated by the usual herbarium procedures including collecting, pressing, poisoning, and mounting. Eventually, the species were identified by the authors using the flora of Libya (Jafri & El-Gadi, 1977-1989; Sherif & El-Taife, 1986). At last, the identified species were deposited at the newly established herbarium, Natural Resources Department, Faculty of Agriculture, University of Tripoli – Libya.

Annotated checklist

The present checklist includes 94 different taxa. Synonyms, distribution and life forms spectrum of plant species were included. Two groups were reported in this study Gymnosperms, and Angiosperms. Families, genera, and species included in this list are arranged alphabetically, and the names of plant species and their synonyms are updated according to the data available on <https://powo.science.kew.org>.

I. Gymnosperms

This group of plants is represented by 2 families, 2 genera, and 2 species (14).

1. Cupressaceae

1.1. *Cupressus sempervirens* L., Sp. Pl. 1002. 1753; Viv. Fl. Lib. Spec. 60. 1824.

Cupressus fastigiata DC, in Lam. et DC. Fl. Franc., ed. 3. Firenze, 2, 2: 73, t.10. 1810; *C. sempervirens* L. var. *stricta* Aiton, Horst. Kew. 3: 372. 1784.; *Cupressus horizontalis* Miller, Gard. Dict. ed. 8, no. 2, 1768.

Distribution: Cyrenaica (Libya), Greece, Crete, Cyprus, Rhodes Islands, Turkey, Syria, Iraq & Iran. - In Jabel Nafousa [Yafran, and El-Riaena].

Life form: Phanerophytes.

2. Pinaceae

2.1. *Pinus halepensis* Mill. Gard. Dict. ed. 8, 1768.

Distribution: Widespread in the Mediterranean region. – In Jabel Nafousa [Yafran].

Life form: Phanerophytes.

II. Angiospermis

This group is represented by 33 families, 81 genera, and 92 species, of which 2 families, 14 genera, and 18 species belong to monocotyledons, and 31 families, 67 genera, and 74 species belong to Dicotyledones.

Dicotyledons

1. Amaranthaceae

1.1. *Anabasis articulata* (Forssk.) Moq. In DC. Prodr. 13(2). 2:212. 1849.

Salsola articulata Forsk., Fl. Aeg.-Arag. 55, tab. 8a. 1775.

Distribution: Sahara-Arabian: North Africa, Palestine, Syria, Arabia.- In Jabel Nafousa [Bir Ayad, Erhebat, Yafran, and Nalut].

Life form: Chamaephytes.

1.2. *Atriplex halimus* L., Sp. Pl. 1052. 1753.

Distribution: Mediterranean region, North Africa (Morocco-Egypt), W. Asia. - In Jabel Nafousa [Jadu, and Shakshuk].

Life form: Chamaephytes.

1.3. *Chenopodium murale* (L.) S. Fuentes, Uotila & Borsch in Willdenowia 42: 14 (2012)

Chenopodium murale L., Sp. Pl. 219. 1753.

Distribution: Cosmopolitan species. – In Jabel Nafousa [Gharyan, Zentan, Nalut, Tijj, El-Joush, and Shakshuk - Jadu].

Life form: Therophytes.

1.4. *Hammada scoparia* (Pomel) Ijjin in J. Bot. US, 33: 583. 1943;

Hammada articulata (Moq.) O. Bolòs & Vigo in Butl. Inst. Catalana Hist. Nat., Secc. Bot. 38(1): 89 (1974) [name mostly accepted];

Haloxylon scoparium Pomel., Nouv. Mat. Fl. Atlant.. 335. 1875; *Salsola articulata* Cav. l.c. 3: 43. t. 284. 1794;

Haloxylon articulatum subsp. *scoparium* (Pomel.) Batt. in Batt. & Trabut., Fl. Alg. 765. 1890; *Arthrophytum scoparium*. (Pomel.) Ijjin ex JehEmb.. & Maire, Fl. Afrique N. 8: 161 (1962)

Distribution: S.E. Spain, N. Africa- Irano-Turanian region. –In Jabel Nafousa [Gharyan, Bir Ayad, Zentan, Jadu, Tandemera, Erhebat, and Nalut].

Life form: Chamaephytes.

1.5. *Bassia indica* (Wight) A.J. Scott in Feddes Repert. 89(2-3): 108 (1978)

Kochia indica Wight, Icon. Pl. Orient.. 5. 2: 5. tT. 1791. 1852; *Kochia griffithii* Bunge ex Boiss., Fl. Orient. 4: 924. 1879.

Distribution: N. Africa (Libya, Egypt), Sudan, Palestine. S.W. Asia to Pakistan and India. – In Jabel Nafousa [Tandemera, Nalut, and El-Joush].

Life form: Therophytes.

1.6. *Suaeda aegyptiaca* (Hasselq.) Zohary in JournJ.. Linn. Soc. Bot. 55: 636. 1957.

Chenopodium aegyptiacum Hasselq. Iter. Palaest. 460. 1757; *Suaeda baccata* Forssk. ex Gmelin in L. Syst. Nat. ed. 13(2): 503. 1791

Distribution: N. Africa (Libya – Egypt), Arabia, Palestine. – In Jabel Nafousa [Gharyan, and El-Joush].

Life form: Therophytes.

2. Anacardiaceae

2.1. *Pistacia atlantica* Desf. Fl. Atlant. 2: 364. 1799.

Pistacia mutica Fisch. & Mey., Bull. Soc. Imp. Naturalistes Moscou 11: 338 (1838)

Distribution: Canary Islands, Mediterranean region, N. Africa, Anatolia, Cyprus, N. E. Greece, Crimea, Caucasia, Iran, Afghanistan and Pakistan. – In Jabel Nafousa [Gharyan, Bir Ayad, Erhebat, and Yafran].

Life form: Nanophanerophytes.

2.2. *Searsia tripartita* (Ucria) Moffett. in Bothalia 37: 173, 2007.

Rhamnus tripartita Ucria in Roem., Arch. i. 1: 68. 1796; *Rhus oxyacantha* auct., non Schousboe ex Cav. Icon. 111, 36. 1794: Durand & Barratte, l.c. 61; *Rhus tripartita* (Ucria) Grande..

Distribution: Dry places in Sicily, Malta, N. Africa, S. W. Asia. - In Jabel Nafousa [Bir Ayad, Shakshuk-Jadu, Yafran, Nalut, Gharyan, and Cabao].

Life form: Nanophanerophytes.

3. Apiaceae

3.1. *Deverra tortuosa* (Desf.) DC., Prodr. 4: 143. 1830.

Bubon tortuosum Desf., Fl. Atlant. 1: 360. 1798. *Pituranthus tortuosus* (Desf.) Benth. & Hook. f. ex Asch. & Schweinf. in Mém. Inst. Egypt. 2: 80. 1887.

Distribution: N. Africa, Palestine. – In Jabel Nafousa [Erhebat, Zentan, Tandemera, Nalut, and Shakshuk].

Life form: Chamaephytes.

4. Apocynaceae

4.1. *Calotropis procera* (Ait) W.T.Aiton., Hort. Kew. 2: 78.:1811.

Asclepias procera Ait., Hort. Kew. 1: 305. 1789.

Distribution: Libya, Tropical to dry sand parts of Africa, Palestine, Abu Dhabi, W. India, Brazil, Colombia and Venezuela. - In Jabel Nafousa [Ras Alpha].

Life form: Nanophanerophytes.

4.2. *Periploca angustifolia* Labill. Icon. Pl. Syr. 2:13. t. 7. 1791.

Periploca laevigata Ait. sSubsp. angustifolia (Labill). Markgr. in Bot. J. Linn. Soc. 64: 375. 1971.

Distribution: Libya, N. Africa, Canary Islands, S.E. Spain and EasternMediterranean, Syria. – In Jabel Nafousa [Gharyan, and Nalut].

Life form: Nanophanerophytes

5. Asteraceae

5.1. *Anacyclus monanthos* (L.) Thell. iIn Méém. Soc. Nat. Hist. Cherbourg ser. 4, 38: 518.1911-2.

Tanacetum monanthos L., Mant. Pl. :1 111. 1767; *Santolina terrestris* Forssk. Fl. Aegypt-Arab.. 147. 1775; *Anacyclus alexandrinus* Willd. , Sp.Pl. ed. 4. 3: 2173. 1803; *Anacyclus alexandrineus* f. *capillifolius* Pamp. Bull. Soc. Bot. Ital. 1914: 19.: 1914.

Distribution: N. Africa to Palestine. – In Jabel Nafousa [Gharyan, Bir Ayad, Yafran, Jadu, and Shakshuk].

Life form: Therophytes.

5.2. *Artemisia campestris* subsp. *glutinosa* (J.Gay ex Besser) Batt . in Fl. Alger: 469, 1889.

Artemisia glutinosa Gay ex Besser Tent. Abrot. 34. 1832; Pamp., l.c.; Keith, l.c.; *A. variabilisa* Ten., Fl. Neap. Prodr. App. 5:28. 1835-38; Keith, l.c. 257; Tutin et al., 186. 1976.

Distribution: Europe, N. Africa. – In Jabel Nafousa [Gharyan, Bir Ayad, El-Riaena, Erhebat, Yafran, Nalut, and Shakshuk].

Life form: Chaemephytes.

5.3. *Artemisia herba-alba* Asso, Syn. Stirp. Aragon. 117. 1779.

Artemisia arnagonensis Lam., Encycl .269. 1783; *A. inculta* Delile, Descr. Egypt, Hist. Nat. 264. 1813; *A. pyromacha* Viv., , Fl. Libyc. Spec. 54. tT. 13 fig. 5. 1824.

Distribution: W. S. France (Pyrens), Spain, N. Africa, Syria-W., & Central Iran. – In Jabel Nafousa [Gharyan, Yafran, Algazaya, and Tendemera].

Life form: Hemicryptophytes

Distribution: N. Africa, eastwards – Pakistan.-In Jabel Nafousa [Gharyan, Jadu, and Bir Ayad,].

Life form: Therophytes

5.4. *Atractylis serratuloides* Siebr ex Cass., Dict. Sci. Nat. 50: 56. 1827.

Atractylis microcephala Coss. & Durieu in Ann. Sci. Nat. Ser. 4(1):240. 1854.

Distribution: N. Africa. - In Jabel Nafousa [Bir Ayad, Zentan, Rgban, and Yafran].

Life form: Hemicryptophytes.

5.5. *Echinops galalensis* Schweinf. In Mém. Inst. Égypt. 2: 2: 762. 1889.

Distribution: N. Africa. – In Jabel Nafousa [Yafran, Gharyan, and Nalut].

Life form: Hemicryptophytes.

5.6. *Helichrysum stoechas* (L.) Moench, Methodus.: 575. 1794; Davis & Kupicha in Davis, Fl. Turkey 5: 85. 1975. *Gnaphalium stoechas* L., Sp. Pl. 853. 1753; *G. caespitosum* Presl, Del. Prag. 98. 1822; *G. siculum* Spreng., Syst. Veg. ed. 16 3:476. 1826; *Helichrysum scandens* Sieber, Herb. Fl. Cret. 1826; *H. caespitosum* (Presl) D C., Prodr. 6: 182. 1838.

Distribution: Mediterranean Europe (Balkans, Italy, Crete, Syprus), N. Africa & Anatolia. In Jabel Nafousa [Gharyan, Bir Ghanum, Rumia in way to Yafran, and Tagma].

Life form: Hemicryptophytes.

5.7. *Launaea nudicaulis* (L.) Hook. er. fil. , Fl. Brit. India 3: 416. 1881.

Chondrilla nudicaulis L. Mant. Pl: 278. 1771; *Microrhynchus nudicaulis* (L.) Less. Syn. Gen. Comp. 139. 1832; *Zollikoferia nudicaulis* (L.) Boiss. , Fl. Orient.. 3: 824. 1875.

Distribution: N. Africa – S. to Central Sahara, Spain & Eastwards – India. – In Jabel Nafousa [Tukkot, Tamzeen, and Gharyan].

Life form: Hemicryptophytes

5.8. *Launaea fragilis* (Asso) Pau. in Bol. Soc. Aragonesa Ci. Nat. 16: 68

Launaea resedifolia (L.) Kuntze, Revis. Gen. 1:351. 1891; *Scorzonera resedifolia* L., Sp. Pl. 1198. 1753; *Leontodon mucronatus* Forssk., Fl. Egypt.-Arab. 144. 1775; *Launaea mucronata* (Forssk.) Muschl, Man. Fl. Egypt 2:1057. 1912; *L. resedifolia* var. *pulchella* Pamp., Agriculture Col. 22: 366 t. 1, f. 2. 1928; l.c. 480; Keith. l.c. 599;); Species 2000 & ITIS Catalogue of Life Naturalis, Leiden, the Netherlands.

Distribution: N. Africa, Spain and Iran. – In Jabel Nafousa [Tagma in way to Yafran].

Life form: Hemicryptophytes.

5.9. *Pallenis hierichuntica* (Michon) Greuter. in Fl. Medit. 7: 47 (1997)

= *Asteriscus pygmaeus* (DC.) Coss. & Durieu; *Asteriscus aquaticus* var. *pygmaeus* DC., Prodr. 7:287. 1838; *Odontospermum pygmaeum* (DC.), O.Hoffm. in Engler & Prantl, Natural. Pflanzenfam. 4(5): 209. 1890.

5.10. *Phagnalon rupestre* (L.) DC., Prodr (DC.). 5:396. 1836.

Conyza rupestris L., Mant. Pl. : 113. 1767.

Life form: Hemicryptophytes.

Distribution: Mediterranean region & S. Spain. – In Jabel Nafousa [Gharyan, Yafran, and Zentan].

5.11. *Rhanterium suaveolens* Desf. , Fl. Atlant.. 2:291. 1799.

Distribution: N. Africa. - In Jabel Nafousa [Gharyan, Nalut, and Cabao].

Life form: Chamaephytes.

5.12. *Sonchus oleraceus* L., Sp. Pl. 794. 1753.

Sonchus ciliatus Lam., Fl. Franc. 2:87. 1778; *S. lacerus* Willd., Sp. Pl. ed.4.3:1513.1803; *S. oleraceus* var. *lacerus* (Willd.) Wallr., Sched. Grit. 432. 1822; *S. oleraceus* ssp. *lacerus* (Willd.) Clos, in Bull. Soc. Bot. France.48:59. 1901; *S. oleraceus* ssp. *ciliatus* (Lam.) Zenari, in Nuovo Giorn. Bot. Ital. 31: 5. 1924.

Distribution: Europe, N. Africa and N.W. Asia. – In Jabel Nafousa [Gharyan, and Zentan].

Life form: Therophytes.

Introduced species as weed of cultivated fields.

6. Boraginaceae

6.1. *Echium angustifolium* Mill. Gard. Dict. ed. 8: 6. 1768.

Echium sericeum Vahl. Symb. 2:35. 1791; *E. sericeum* var. *diffusum* (Sibth. & Sm.) Boiss., Fl. Orient.. 4: 207.1879.

Distribution: Mediterranean region and Syria. – In Jabel Nafousa [Gharyan, and Nalut].

Life form: Hemicryptophytes.

6.2. *Heliotropium ramosissimum* (Lehm.) DC. Prodr. (DC.) 9: 536. 1845.

Lithospermum hispidum Forssk. Fl. Aegypt. - Arab. 39. 1775; *Heliotropernum crispum* Desf., Fl. Atlant. 1:151. Tab.41. 1789; *H. undulatum* Vahl var. *ramosissimum* Lehm., Icon. Descr. Strip, t. 40. 1831; *H. nubicum* Burge in Bull. Soc. Nat. Moscoue. 421/1: 320. 1869.

Distribution: Iran, Afghanistan, N.Africa. – In Jabel Nafousa [Nalut].

Life form: Therophytes

6.3. *Trichodesma africanum* (L.) R. Br., Prodr. Fl. Nov. Holland. 1: 496. 1910.

Borago africana L., Sp. Pl. 138. 1753.; *B. verrucosa* Forssk., Fl. Aegypt. - Arab. 41. 1775; *Pollichia africana* Medik., Bot. Beo.. 247. 17843; *Trichodesma africanum* var. *homotrichum* Bornm. et Kneuck. in Allg. Bot. Zeit. Syst. 22: 2.: 1916.

Distribution: Afghanistan. Pakistan. Iran. Africa.- In Jabel Nafousa [Cabao, and Yafran].

Life form: Therophytes.

7. Brassicaceae.

7.1. *Ammosperma cinereum* (Desf.) Baill. Hist. Pl. 3: 278 (1871).

Siysmbrium cinereum Desf., Fl. Atlant. 2: 83. t. 157. 1798; *Moricandia cinerea* (Desf.) Coss., Compend. 2:145. 1887; *Diploaxis cinerea* (Desf) Pomel, Nouv. Mat. 359. 1875.

Distribution: N. Africa.- In Jabel Nafousa (Tiji).

Life form: Therophytes.

7.2. *Farsetia aegyptia* Turra, Dissert. Farsetia 1: t. 1. 1765.

Cheiranthus farsetia L. Mant. Pl. 94. 1767; *Farsetia ovalis* Boiss., Diagn. Pl. Orient. Ser. 1, 8.: 32. 1849; *F. oblongata* Presl, Bot. Bemerk. 8. 1844.

Distribution: N. Africa, Syria, Arabia, Palestne. – In Jabel Nafousa [Shakshuk, Qasre Alhaj, Gharyan, and Nalut,].

Life form: Chamaephytes.

7.3. *Matthiola fruticulosa* (L.) Maire in Cat. Pl. Maroc. 2: 311. 1932.

Cheiranthus fruticulosa L., Sp. Pl. 662. 1753; *C. tristis* L., Sp. Pl. ed. 2: 925. 1759; *Matthiola tristis* (L.) R. Br. in Ait., Hort. Kew.. ed 2 .4:120.1812.

Distribution: Spain, Italy & Montpellier. - In Jabel Nafousa [Yafran, Kabo, Nalutm Jadu, Tagma, and Shakshuk].

Life form: Chamaephytes.

7.4. *Matthiola longipetala* (Vent.) DC., Syst. Nat. (DC.) 2:174.1821.

Cheiranthus longipetalus Vent. Descr. Pl. Nov. 93. 1802; *Matthiola oxyceras* DC., l.c. 173.

Distribution: Irano-Turanian element: S. Europe, N. Africa, Arabia, W. Asia, to S. Russia & Turkey. - In Jabel Nafousa [Gharyan, Zentan, Tandemera, and Nalut].

Life form: Therophytes.

7.5. *Zilla spinosa* (L.) Prantl in Engler & Prantl, Pflanzenfam, 3 (2): 174. 1890.

Bunias spinosa L., Mant. Pl. 1:96. 1767.

Distribution: Arabia, Palestine, Egypt- Libya. In Jabel Nafousa [Nalut, and Weshka].

Life form: Chamaephytes

8. Cactaceae

8.1. *Opuntia ficus-indica* (L.) Mill. Gard. Dict. ed. 8:2. 1768.

Cactus ficus-indica L. Sp. Pl. 468. 1753; *Opuntia ficus-barbarica* Berger in Monatsshr. Kakt. 22: 181. 1912.

Distribution: Tropical America, C. America, Mediterranean region. – In Jabel Nafousa [Gharyan, Tandemera, and El-Joush].

Life form: Nanophanerophytes.

9. Caryophyllaceae

9.1. *Gymnocarpos decander* Forssk. Fl. Aegypt. - Arab. 65. 1775.

Trianthema fruticosum Vahl, Symb. Bot. 1: 32. 1790; *Gymnocarpos fruticosum* (Vahl) Pers., Syn. Pl. 1: 262. 1805.

Distribution: Canary Islands estwards to Pakistan and Afghanistan through N. Africa and Arabia. - In Jabel Nafousa [Gharyan, Bir Ayad, Yafran, and Tandemera].

Life form: Chamaephytes.

9.2. *Paronychia capitata* (L.) Lam. Fl. Franc. (Lamarck). 3: 229. 1779.

Illecebrum capitatum L., Sp. Pl. 2071. 1753; *I. herniarioides* Pour., in Mem. Acad. Toulouse, 3: 321.1788;

Paronychia rigida Moench, Method, 315, 1794; *P. nivea* DC. in Poiret, Encycl. 5: 25. 1804; *P. capitata* (L.) Lam. subsp. *nivea* (DC.) Maire & Weiller, in Maire, l.c. 9: 31.1963.

Distribution: N. African Sahara, Palestine and S. Europe.- In Jabel Nafousa [Bir Ayad, Yafran, and Tandemera].

Life form: Hemicryptophytes.

10. Casuarinaceae

10.1. *Allocasuarina verticillata* (Lam.) L.A.S. Johnson., in J. Adelaide Bot. Gard. 6: 79 (1982).

Casuarina stricta Ait., Hortus. Kew. 3; .320. 1789; *Casuarina quadrivalvis* Labill. Pl. Nov. Holl. 2: 67, t. 218. 1806.

Distribution: Australia; Introduced to Libya. – In Jabel Nafousa [El-Joush].

Life form: Phanerophytes

11. Cistaceae

11.1. *Helianthemum lippii* (L.) Dum. Cours. Bot. Cult. 3: 130. 1802.

Cistus lippii L. Mant. Pl. 2: 245. 1767.

Distribution: N. Africa, W. Asia, eastwards- Pakistan. – In Jabel Nafousa [Gharyan, Nalut, and El-Riaena].

Life form: Chamaephytes

12. Convolvulaceae

12.1. *Convolvulus dorycnium* L. Syst. Nat. Ed. 10, 2: 923. 1759.

Distribution: Greece, Crete, Tunisia, Libya and Egypt. – In Jabel Nafousa [Gharyan, Jadu, and El-Riaena].

Life form: Chamaephytes.

13. Cucurbitaceae

13.1. *Citrullus colocynthis* (L.) Schrad. in Linnaea 12: 414.1838.

Cucumis colocynthis L., Sp. Pl. 1011. 1753.

Distribution: South Europe, North Africa, Arabia, Eastwards to India & Ceylon.- In Jabel Nafousa [El-Riaena, Kabo, and Nalut].

Life form: Hemicryptophytes.

14. Euphorbiaceae

14.1. *Ricinus communis* L., Sp. Pl. 1430. 1753.

Distribution: Most Tropical and subtropical countries. – In Jabel Nafousa [Gharyan, Yafran, and Nalut].

Life form: Nanophanerophytes.

15. Fabaceae

15.1. *Acacia saligna* (Labill.) H.L.Wendl., in Comm. Acac. Aphyll.: 26 (1820).

Acacia cyanophylla Lindl, Edward's Bot. Reg. 45. 1839.

Distribution: Native of Australia. - In Jabel Nafousa [Bir Ayad, and Yafran].

Life form: Phanerophytes.

15.2. *Argyrolobium uniflorum* (Decne.) Jaub. & Spach, Ill. Pl.Or. 1:115. 1842.

Cystisus uniflorus Decne., in Ann. Sci. Nat. Bot. sér. 2. 3: 265. 1853.

Disatribution: N. Africa, Sinai, Palestine. Syria, S. Anatolia. – In Jabel Nafousa [Gharyan, Cabao, Shakshuk, Qasr Alhaj, Nalut, and Tamzeen].

Life form: Chamaephytes

15.3. *Lotus cytisoides* L., Sp. Pl. 776. 1753.

Lotus creticus var. *cytisoides* (L.) Boiss., Fl. Orient. 2: 165. 1872; *L. creticus* subsp. *cytisoides* (L.) Aschers.

Distribution: Mediterranean region. – In Jabel Nafousa [Gharyan].

Life form: Therophytes.

15.4. *Astragalus trigonus* DC., Astragalogia. 186.. 1802.

Astragalus leucacanthus Boiss., Diagn. Pl. Orient. ser. 1,9: 93. 1849; *A. trigonus* var. *leucacanthus* (Boiss.) Tackh. et Boulos in Publ. Cairo Univ. Herb. 5: 69. 1972.

Distribution: Egypt and Libya. – In Jabel Nafousa [Nalut].

Life form: Therophytes.

15.5. *Calicotome villosa* (Poir.) Link in Schrad, Neues. J. Bot. 2(2): 51. 1806.

Spartium villosum Poir., Voy. Barb. 2: 207. 1789; *Calicotome rigida* (Viv.) Maire & Weiller., in Bull. Soc. Hist. Nat. Afr. Nord 30: 271. 1939. *C. villosa* var. *rigida* (Viv.) Beg. et Vacc., Cont. Fl. Lib. 47. 1912.

Distribution: S. Europe, N. Africa, Palestine. – In Jabel Nafousa [Gharyan, Yafran, and Al- Riaena].

Life form: Nanophanerophytes.

15.6. *Ononis angustissima* Lam., Encycl. 1: 508, 1783; Pamp., Pl. Trip. 149. 1914.

Ononis longifolia Willd. Enum. 750. 1809; *O. falcate* Viv. Fl. Lib. Spec. 41, t. 18.1824; *O. natrix* var. *falcate* (Viv.) Durand & Barrette, Fl. Lib. Prodr. 66. 1910; Pamp., Pl. Trip. 149. 1914.

Distribution: W. Mediterranean region. - In Jabel Nafousa [Gharyan, Tandemera, and Erhebat].

Life form: Chamaephytes.

15.7. *Retama raetam* (Forssk.) Webb in Webb. Phyt. Canaries. 2: 56.1842.

Genista raetam Forssk. Fl. Aeg. -Arab. 214. 1775; *Spartium raetam* (Forssk.) Spach in Ann. Sc. Nat. ser. 2: 19. 288. t. 16. 1843; *Retama duriaei* (Spach) Webb, in Ann. Sc. Nat. ser. 2 .20: 279. 1843.

Distribution: N. Africa, Palestine and Syria. – In Jabel Nafousa [Gharyan, Bir Ayad, Yafran, and Nalut].

Life form: Nanophanerophytes.

15.8. *Vachellia nilotica* subsp. *adstringens* ((Schumach. & Thonn.) Kyal. & Boatwr. in Bot. J. Linn. Soc. 172: 515. 2013.

Acacia nilotica (L.) Delile, Descr. Egypte, Hist. Nat. 79. 18913; *Mimosa nilotica* L. Sp. Pl. 521. 1753; *M. Arabica* Lam., Encycl. 1:19. 1783; *Acacia arabica* (Lam.) Willd., Sp. Pl. 4: 1083. 1806; *A. nilotica* subsp. *adansonii* (Guill. & Perr.) Brenan, in Kew Bull. 12: 85. 1957.

Distribution: Afro-Asian Species.- In Jabel Nfousa [El-Riaena, and Yafran].

Life form: Phanerophytes.

16. Frankeniaceae

16.1. *Frankenia pulverulenta* L., Sp. Pl. 332. 1753.

Distribution: S. & S. E. Europe, Africa, Siberia, Turkey Iran, Syria, Palestine, Arabia, Pakistan & N. W. India. – In Jabel Nafousa [Nalut].

Life form: Therophytes.

17. Geraniaceae

17.1. *Erodium glaucophyllum* (L.) L'Hér. in Ait., Hort. Kew 2: 416. 1789.

Geranium glaucophyllum L., Sp. Pl. 679. 1753; *E. tordilioides* sensu Viv. Fl. Libyc. Spec. 39. 1824.

Distribution: N. Africa, Jordan, Sinai, Syria, Iraq, Kuwiat, Arabia and Iran. – In Jabel Nafousa [Cabao, Yafran, Nalut, Gharyan, Shakshuk, and Nalut].

Life form: Therophytes.

A very common plant species in Jabel Nafousa area.

17.2. *Erodium laciniatum* (Cav.) Willd. Sp. Pl. 3: 633. 1800.

Geranium laciniatum Cav., Dissert. Bot. 5: 4: 228. t. 113. 1787; *E. laciniatum* subsp. *pulverulentum* (Cav.) Burt & Lewis in Kew Bull. 1954. 405. 1954.

Distribution: N. Africa, S. Europe, Eastwards to Pakistan. - In Jabal Nafousa [Cabao, Nalut, Jadu, and Shakshuk].

Life form: Therophytes.

18. Lamiaceae

18.1. *Salvia aegyptiaca* L. Sp. Pl. 23. 1753.

Distribution: Cape Verde Islands, Canary Islands, S. Morocco Sahara, N. Africa, Niger, Chad, Sudan, Pakistan & India. – In Jabel Nafousa [Qasr Alhaj, Gharyan, Bir Ayad, Jadu, Nalut, and Shakshuk].

Life form: Chamaephytes.

18.2. *Salvia rosmarinus* Spenn. in Handb. Angew. Bot. 2: 447 (1835).

Rosmarinus officinalis L., Sp. Pl. 23. 1753. *Rosmarinus angustifolius* Mill. Gard. Dict. ed. 8: 1. 1758; *Salvia rosmarinus* Schleid., Handb. Med.-Pharm. Bot. 1. 265. 1852.

Distribution: Portugal, N. W. Spain, Mediterranean region. – In Jabel Nafousa [Yafran].

Life form: Chamaephytes

18.3. *Teucrium polium* L., Sp. Pl. 566. 1753.

Teucrium polium L. subsp. *cyrenaicum* Maire et Weiller, Bull. Soc. Hist. Nat. Afr. Nord. 30: 297. 1939.

Distribution: S. Europe, S. C. Russia, Turkey, Syria, Palestine, Saudi Arabia, Iraq, Iran, N. Africa, E. Africa and Somalia. – In Jabel Nafousa [Gharyan, Zentan, Rajban, Cabao, Nalut, and Shakshuk].

Life form: Chamaephytes.

18.4. *Thymbra capitata* (L.) Cav. in Elench. Pl. Horti Matr.: 37.1803.

Thymus capitatus (L.) Hoffm. & Link, Fl. Port. 1:123: 1809 ; *Satureja capitata* L., Sp. Pl. 568. 1753; *Cordiothymus capitatus* (L.) Rchb., f. in Oestr. Bot. Wochenbl. 7: 161 t. 70. 1857.

Distribution: Mediterranean region of Europe & Africa. – In Jabel Nafousa [Yafran, Gharyan, Jadu, and Nalut].

Life form: Chamaephytes.

19. Malvaceae

19.1. *Malva sylvestris*. L., Sp. Pl. 689. 1753.

Distribution: N. Africa-S. W. Asia, W. Europe. – In Jabel Nafousa [Zentan, and Yafran].

Life form: Hemicryptophytes.

20. Myrtaceae

20.1. *Eucalyptus camaldulensis* Dehnh. Pl. Hort. Camald. ed. 2: .20.1832.

Distribution: A native of Australia. - In Jabel Nafosa [Erhebat].

Life form: Phanerophytes

20.2. *Eucalyptus gomphocephala* DC. Prodr. 3. 220. 1828.

Distribution: Australia, cultivated elsewhere. - In Jabel Nafousa [Erhebat].

Life form: Phanerophytes

21. Orabancaceae

21.1. *Cistanche violacea* (Desf.) Hoffm. & Link, Fl. Portug. 1: 320. 1813.

Phelypaea violacea Desf. , Fl. Atlant. 2: 60 t. 145. 1798.

Distribution: N. Africa (Morocco – Egypt).- In Jabel Nafousa [Cabao, and El-Joush].

Life form: Hemicryptophyte.

22. Papaveraceae

22.1. *Fumaria parviflora* Lam., Encycl. 2: 567. 1788.

Fumaria ceaspitosa Loscos ex Willk. & Lange, Prodr. Fl. Hisp. 3: 884. 1880; *F. glauca* Jord., Mém. Acad. Roy. Sci. Lyon, Sect. Sci. sér. 2, 1: 219 (1851).

Distribution: Europe, S. Russia, N. Africa and S.W. Asia. - In Jabel Nafousa [Yafran, Jadu, and Nalut].

Life form: Therophytes.

23. Plantaginaceae

23.1. *Kickxia aegyptiaca* (L.) Nabelek, Iter Turc. -Pers. 3, Publ. Fac. Sci. Univ. Masaryrk 70:31. 1926.

Distribution: N. Africa to Arabia. – In Jabel Nafousa [Gharyan, Bir Ayad, Tandemera, Yafran, Tamzeen, and Nalut].

Life form: Hemicryptophytes.

24. Polygonaceae

24.1. *Polygonum equisetiforme* Sibth. & Sm., Prodr, Fl. Graeca Prodr.1: 266, 1809.

Distribution: S. Europe, S.W. Asia, N. Africa, Syria, Palestine, Iraq, Iran & Afghanistan. – In Jabel Nafousa [Tandemera, Gharyan, Cabao, and Yafran].

Life form: Chamaephytes.

25. Rhamnaceae

25.1. *Ziziphus lotus* (L.) Lam. subsp. *lotus*, in: Lam. Encycl. 3:317.1789.

Rhamnus lotus L., Sp. Pl. 194. 1753.

Distribution: S. Europe, N. Africa – Arabia. – In Jabel Nafousa [Bir Ayad, Yafran, Jadu, Nalut, Tamzeen, and Shakshuk].

Life form: Nanophanerophytes.

26. Rutaceae

26.1. *Haplophyllum tuberculatum* (Forssk.). A. Juss. Mém. Mus. Hist. Nat. Paris 12: 528, tab.17. 1825; Durand & Barratte, Fl. Lib. Prodr. 59. 1910.

Ruta tuberculata Forssk., Fl. Aegypt. - Arab. 86. 1775; *R. tuberculata* var. *montbretii* DC., Prodr. 1: 711. 1824;

R. montbretii (D C.) Viv. Fl. Egypt. Dec. 13. 1930; *Haplophyllum propinquum* Spach in Ann. Sci. Nat. Ser. 3(2):

189. 1849; *Haplophyllum arabicum* Boiss. Diagn. Pl. Orient. 1 (8): 127. 1849; *Haplophyllum trichostylum* Bunge ex Boiss. Fl. Orient. 1: 941. 1867.

Distribution: N. Africa, Sudan, Somalia, S.W. Asia. In Jabel Nafousa [Cabao].

Life form: Chamaephytes.

It is a desert species.

27. Solanaceae

27.1. *Datura innoxia* Mill. Gard. Dict. ed. 8. 5. 1768.

Distribution: Naturalized mostly in Mediterranean region.- In Jabel Nafousa [El-Riaena].

Life form: Chamaephytes

27.2. *Lycium shawii* Roem. & Schult., Syst. Veg. 4: 693. 1819.

Lycium persicum Miers, Ann. Mag. Nat. Hist., 2 ser. 14: 12. 1854; *L. arabicum* Schweinf. ex Boiss. Fl. Orient. 4: 289. 1879.

Distribution: N. Africa (Libya & Egypt), E. Sinai, S. Palestine, Arabia, Kweit, S. Iraq. S.W. Iran & Pakistan. – In Jabel Nafousa [Jadu, Yafran, and El-Riaena].

Life form: Nanophanerophytes.

27.3. *Nicotiana glauca* Graham, Edinb. New Philos. Jour., 5: 175. 1828.

Distribution: Italy, Barse, Messine, Malta, Morocco, Algeriqa, Tunisia, Libya, Egyptr, Lebanon and Palesine. – In Jabel Nafousa [Gharyan, Bir Ayad, and Yafran,].

Life form: Nanophanerophytes.

28. Tamaricaceae

28.1. *Tamarix aphylla* (L.) H. Karst. , Deutsche Fl. 641. 1882.

Thuja aphylla L., Cent. Plant. 1:32. 175; *Tamarix orientalis* Forssk. Fl. Aegypt.-Arab. 206. 1775; *T. articulata* Vahl. Symb. Bot. 2:48. t. 32. 1791.

Distribution: N. Africa eastwards to Afghanistan and Indo-Pakistan. – In Jabel Nafousa [Gharyan, Nalut, and El-Joush].

Life form: Phanerophytes.

29. Zygophyllaceae

29.1. *Nitraria retusa* (Forssk.) Aschers. Verh. Bot. Ver. Brandenburg. 18: 94. 1876.

Peganum retusum Forssk. Fl. Aegypt.-Arab. 60. 1775; *N. tridentata* Desf. Fl. Atlant. 1: 372. 1798.

Distribution: Libya eastwards to S.W. Pakistan. – In Jabel Nafousa [Erhebat, and El-Joush].

Life form: Nanophanerophyte

29.2. *Peganum harmala* L., Sp. Pl. 444. 1753.

Peganum dauricum Pall. Reise 1: 418. 1776.

Distribution: N. Africa, S. Europe, Asia Minor, Middle East, S Russia, Iran, Afghanistan, Pakistan, Kashmir, Tibet, India and Australia. – In Jabel Nafousa [Gharyan, Bir Ayad, Yafran, and Jadu].

Life form: Therophytes.

29.3. *Tribulus pentandrus* Forssk. Fl. Aegypt.-Arab., 81. 1775.

Tribulus alatus Delile, Fl. Aeg. Illustr. 2: 62. 1813; *Tribulus parsvispinus* C. Presl, Bot. Bemerk.. 29. 1844; *Tribulus bimucronatus* Viv., Pl. Aegypt. Dec. 4: 9. 1831.

Distribution: S. & N. Africa, Madagascar, S. W. Arabia.-In Jabel Nafousa [Nalut].

Life form: Hemicryptophytes.

29.4. *Zygophyllum creticum* (L.) Christenh. & Byng. in Global Fl. 4: 93 (2018).

Fagonia cretica L., Sp. Pl. 386. 1753.

Distribution: A Mediterranean element; found in S. Europe, Canary Islands and N. Africa. – In Jabel Nafousa [Gharyan, Tandemera, Jadu, Nalut, and Shakshuk].

Life form: Hemicryptophytes.

29.5. *Zygophyllum glutinosum* (Delile) Christenh. & Byng. in Global Fl. 4: 93 (2018).

Fagonia glutinosa Delile, Fl. Egypte, Explic. Pl. 230. t. 28(2). 1813.

Distribution: N. Africa Sahara- eastwards- Kuwait, Bahrien, Pakistan. – In Jabel Nafousa [Jadu, and Nalut].

Life form: Hemicryptophytes

29.6. *Zygophyllum album* L., Sp. Pl. ed. 2. 551. 1762.

Tetraena alba (L. f.) Beier & Thulin, Pl. Syst. Evol. 240(1-4): 35 (2003).

Distribution: South Europe, N. Africa, Palestine, Lebanon, Syria, and Turkey. – In Jabel Nafousa [Yafran, and El-Joush].

Life form: Chamaephytes.

Monocotyledons

1. Arecaceae

1.1. *Phoenix dactylifera* L., Sp. Pl. 1188, 1753.

Distribution: Morocco - India, California & Arizona (USA).- In Jabel Nafousa [El-Joush].

Life form: Phanerophytes

2. Asparagaceae

2.1. *Asparagus horridus* L. Syst. Veg., ed. 13.: 274 (1774).

Asparagus stipularis Forssk. Fl. Aeg. –Arab. 72. 1775 ; *Asparagus horridus* L., f., Suppl. 203. 1781; *A. stipularis* var. *brachyclados* Boiss. Fl. Orient.. 5: 338. 1884.

Distribution: N. Africa, Sicily, Cyprus, Palestine and Syria. – In Jabel Nafousa [Gharyan, Bir Ayad, and Yafran].

Life form: Geophytes.

3. Asphodelaceae

3.1. *Asphodelus ramosus* L. in Sp. Pl.: 310 (1753)

Asphodelus microcarpus Salzm. & Viv. Fl. Cors. Diag. 5. 1824; *Asphodelus africanus* Jord. In Bull. Soc. Bot. 7: 730. 1860; *Asphodelus microcarpus* var. *africanus* (Jord.) Maire et Weill. In Maire, I.C. 29.

Distribution: Mediterranean region and the Canaries. – In Jabel Nafousa [Gharyan, Bir Ayad, Yafran, and Zentan].

Life form: Geophytes.

3.2. *Asphodelus fistulosus* L., Sp. Pl. 309. 1753.

Asphodelus fistulosus var. *atlanticus* Jah. M aire & Weiller in Maire. Fl. Afr. Nord. 5: 37. 1958.

Distribution: Mediterranean region. – In Jabel Nafousa [Gharyan, and El-Joush].

Life form: Geophytes

3.3. *Asphodelus refractus* Boiss., Diagn. Pl. Orient.. Ser. 1, 13: 23. 1854.

Asphodelus pendulinus Coss. et Durieu, in Bull. Soc. Nat. France, 4. 399. 1857.

Distribution: Sahro-Arabian element: Libya. Tunisia, Algeria and South of Arabian Peninsula.- In Jabel Nafousa [Yafran, Kabo, Jadu, and Nalut].

Life form: Geophytes

4. Poaceae

4.1. *Arundo donax* L., Sp. Pl. 81. 1753.

Donax arundinaceous P. Beauv., Ess. Agrost. 161. 1812; *Arundo bifaria* Retz., Obs. Bot. 4: 21. 1786; *A. bengalensis* Retz., Obs. Bot. 5: 20. 1799.

Distribution: Mediterranean region, Pakistan, India, and Burma. - In Jabel Nafousa [Yafran].

Life form: Geophytes.

4.2. *Avena barbata* Pott ex Link, in Schrad. J. Bot. (Schrader). 2: 314. 1799.

Distribution: Mediterranean region, Anatolia, Iraq, Iran and Afghanistan. – In Jabel Nafousa [Jadu, and Shakshuk].

Life form: Therophytes.

4.3. *Avena sterilis* L., Sp. Pl. ed. 2: 118. 1762; Pamp. Pl. Trip. 12. 1914.

Distribution: Mediterranean region, Iraq, Iran, Arabia, Anatolia. - In Jabel Nafousa [Gharyan, and Yafran].

Life form: Therophytes.

4.4. *Cutandia memphitica* (Spreng.) K. Richt, Pl. Europ. 1: 77. 1890.

Dactylis memphitica Spreng. Bot. Gart. Halle, Nachtr. 1: 20. 1801; *Scleropoa memphitica* (Spreng.) Parl., Fl. Ital. 1: 470. 1848.

Distribution: Mediterranean Europe and N. Africa, Syria, Lebanon, W. Pakistan, Afghanistan and C. Asia. – In Jabel Nafousa [Gharyan, Cabao, and Nalut].

Life form: Therophytes.

4.5. *Cynodon dactylon* (L.) Pers., Syn. Pl. 1: 85 (1805).

Panicum dactylon L., Sp. Pl. 58. 1753.

Distribution: Cosmopolitan. - In Jabel Nafousa [Gharyan, Zentan, Tandemera, and Yafran].

Life form: Geophytes.

4.6. *Hyparrhenia hirta* (L.) Stapf, in Prain, Fl. Trop. Afr. 9: 315. 1919.

Andropogon hirtus var. *pubescens* (Andersson) Vis., Fl. Dalm. Suppl.: 150, 1872.

Distribution: Mediterranean region, S. W. Asia, Pakistan, N.W. India, S. & E. Africa. - In Jabel Nafousa [Gharyan, Jadu, Shakshuk, Bir Ayad, and Nalut].

Life form: Therophytes

4.7. *Imperata cylindrica* (L.) Raeusch., Nomencl. Bot. ed. 3, 10. 1797.

Lagurus cylindricus L., Syst. Nat., ed. 10, 2: 878.1759; *Saccharum cylindricum* (L.) Lam., Encycl. Method. Bot. 1: 594. 1785; *Imperata cylindrica* (L.) P. Beauv., Ess. Agrost. 165, t.5.1812.

Distribution: Africa, S. Europe, S. W. & C. Asia. - In Jabel Nafousa [Near Nalut].

Life form: Geophytes

4.8. *Lamarckia aurea* (L.) Moench, Methodus. 201. 1794.

Cynosurus aureus L., Sp. Pl. 73. 1753.

Distribution: Mediterranean region, Ethiopia, Iran, Afghanistan and Pakistan. - In Jabel Nafousa [Gharyan, and Yafran].

Life form: Therophytes

4.9. *Lolium rigidum* Gaudin, Agrost. Helvet. 1: 334. 1811.

Distribution: Europe, Mediterranean region, Middle East and the Caucasus. - In Jabel Nafousa [Gharyan, Bir Ayad, Yafran, and Nalut].

Life form: Therophytes.

4.10. *Macrochloa tenacissima* (L.) Kunth, in Révis. Gramin. 1: 59. (1829).

Stipa tenacissima L., Cent. Pl. 1: 6. 1755.

Distribution: Iberian Peninsula, N. Africa, Balears. – In Jabel Nafousa [Gharyan, Tandemera, Yafran, and Shakshuk].

Life form: Geophytes.

4.11. *Lygeum spartum* Loefl. ex L., Cent. Pl. ed. 5, 1: 4. 1754.

Distribution: Mediterranean region. – In Jabel Nafousa [Gharyan, Bir Ayad, and Yafran].

Life form: Geophytes.

A widely occurring species in Libya.

4.12. *Oloptum miliaceum* (L.) Röser & Hamasha, in Pl. Syst. Evol. 298: 365. (2012).

Piptatherum miliaceum (L.) Coss., Not. Pl. Crit. 129. 1812 ; *Agrostis miliacea* L. Sp. Pl. 61. 1753; *Oryzopsis miliacea* (L.) Benth. et Hooker. f. ex Ascherson et Schweinf. Ill. Fl. Egypt (Asch. & Schweinf.): 169. 1887.

Distribution: Mediterranean region, Syria, Jordan-Iran.-In Jabel Nafousa [Bir Ayad, Gharyan, Nalut, and Tandemera].

Life form: Chamaephytes.

4.13. *Rostraria salzmannii* (Boiss.) Holub. in Folia Geobot. Phytotax. 9: 272. (1974).

Lophochloa salzmannii (Boiss.) H. Scholz in Willdenowia, 6: 292. 1971; *Koeleria salzmannii* Boiss. et Reut, Pugillus, Pl. Afr. Bor. Hispan.: 123. 1852.

Distribution: N. Africa, Iberian Peninsula. - In Jabel Nafousa [Gharyan, Bir Ayad, Tandemera, Yafran, and Nalut].

Life form: Therophytes

4.14. *Stipellula capensis* (Thunb.) Röser & Hamasha. in Schlechtendalia 24: 92. (2012.)

Stipa capensis Thunb. Prodr. Fl. Cap. 19. 1794

Stipa retorta Cav., Observ. Hist. Nat. 1:119. 1795; *Stipa tortilis* Desf., Fl. Atlant. 1: 99. t. 31. F. 1. 1798.

Distribution: Mediterranean region, N. and S. Africa, Palestine, Iraq, Iran, Afghanistan, Pakistan, Arabia and India. – In Jabel Nafousa [Gharyan, Tandemera, and Shakshuk].

Life form: Therophytes.

Results

This paper deals mainly with the vascular summer flora of Jabel Nafousa. The results of this study revealed the presence of 35 families, 83 genera, and 94 species of which 33 families, 81 genera, and 92 species belong to Angiosperms, and 2 families, 2 genera, and 2 species belong to Gymnosperms. The total number of plant species collected from the area of study is not comparable with the number of species that appeared in publications by different authors (Boulos, 1972; Corti, 1942; Durand & Barratte, 1910; Jafri, S. M. H. & El-Gadi, 1977-1989; Keith, 1965; Pampanini, 1914-1931; Viviani, 1824; Qaiser, M. & El-Gadi, 1984; Sherif, & Siddiqi, 1988). In addition to that, the family *Poaceae* represents the most sizable family with 14 species, followed by the family *Asteraceae* with 12 species, then the families *Amaranthaceae*, *Fabaceae*, and *Zygophyllaceae* with 6 species each, whereas, the families *Brassicaceae*, *Lamiaceae*, and *Liliaceae* represented with 5, 4, 4 species respectively (Table 1 and Fig. 2). Other families represented with 1-3 species. Three species are considered the most dominant in the area of Jabel Nafousa, which are, *Hammada scoparia*, *Retamaa raetam*, and *Ziziphus lotus*. The dominance of these species indicates that the region of Jabel Nafousa lies in a climate of an arid-semiarid zone due to the little amount of rainfall received yearly in winter, and very hot and dry conditions in summer. In general, plant species collected from Jabel Nafousa are getting well adapted to the severe conditions of the region. The results of this study showed that all the genera except for 4 genera *Acacia*, *Asphodelus*, *Avena*, and *Matthiola* represented by only one species (Annotated list). Such results indicate that most genera recorded in this study are represented by one species each, such characters declare that the flora of the Jabel Nafousa region is very poor. Moreover, the life forms of the summer

flora of Jabel Nafousa were analyzed according to the Raunkiaer system (1934) as modified by Govaerts *et al.* (2000), the results declared the dominance of Therophytes with 24 species, followed by Chamaephytes with 22 species (Table 2 and Fig. 3). The results of life forms spectrum were expected due to little amount of rainfall received in winter, and extreme conditions of hot and dry situation in summer.

Table 1. The most sizable families in Jabel Nafousa and the percentage of species

| Families | No of species | percentage |
|----------------|---------------|------------|
| Poaceae | 14 | 14.893 % |
| Asteraceae | 12 | 12.765 % |
| Amaranthaceae | 6 | 6.382 % |
| Fabaceae | 6 | 6.382 % |
| Zygophyllaceae | 6 | 6.382 % |
| Brassicaceae | 5 | 5.434% |
| Lamiaceae | 4 | 4.255 % |
| Liliaceae | 4 | 4.255 % |

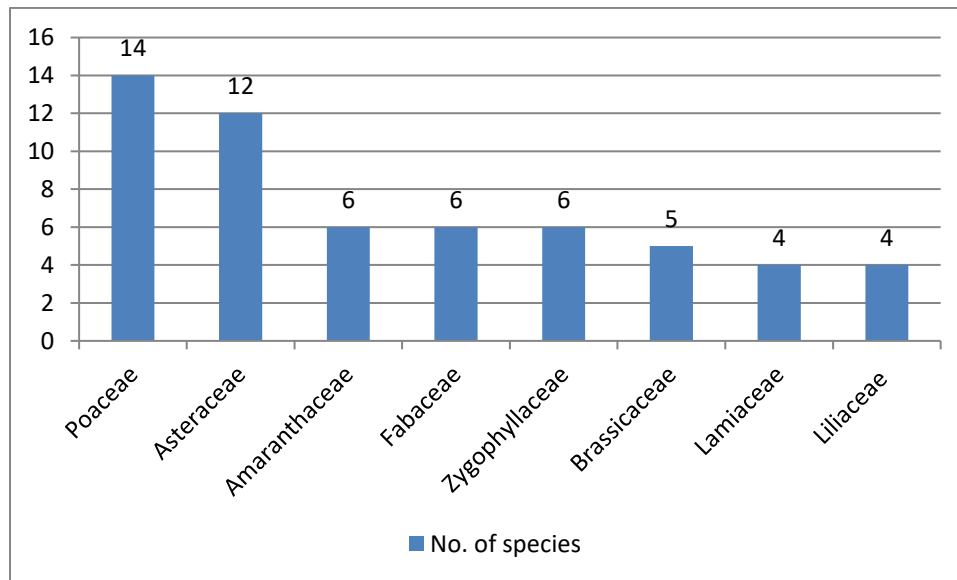
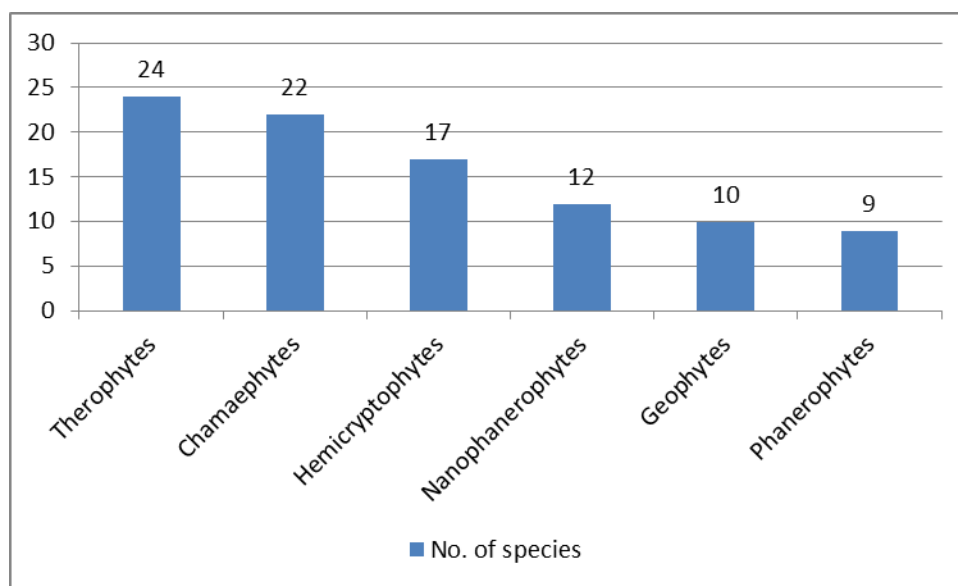


Figure 2. The most sizable families in Jabel Nafousa

Table 2. The life forms spectrum of plant species in Jabel Nafousa and the percentage of species

| Life forms | No of species | Percentage |
|-------------------|---------------|------------|
| Therophytes | 24 | 25.531 % |
| Chamaephytes | 22 | 23.404 % |
| Hemicryptophytes | 17 | 18.085% |
| Nanophanerophytes | 12 | 12.765% |
| Geophytes | 10 | 10.638 % |
| Phanerophytes | 9 | 9.574% |

**Figure 3.** The life forms spectrum of plant species in Jabel Nafousa

Discussion

The study of the summer flora of Jabel Nafousa represents the first attempt of its nature. In this study, 94 species belong to 35 families, and 83 genera were collected and identified. The results showed that the families *Poaceae*, *Asteraceae*, *Amaranthaceae*, *Fabaceae*, *Zygophyllaceae*, and *Brassicaceae* are considered as the largest families with 14, 12, 6, 6, 6, and 5 species respectively, whereas, the families *Lamiaceae*, and *Liliaceae* represented 4 species each. Other families are represented with 1-3 species. Although the family *Poaceae* represents the largest family in the area of study, it represents only 6.14% of the total number of the family species in Libya (Sherif, & Siddiqi, 1988; Al-Sghair *et al*, 2019). Three species were found to be the most dominant in the study region, which are *Hammada scoparia*, *Retama raetam*, and *Ziziphus lotus*. The common

features of the summer flora of Jabel Nafousa are represented by large and scattered communities of *H. scoparia*, *R. raetam*, and *Z. lotus*. Moreover, the nature of plant species of the Jabel Nafousa region gives a good indication of the Sahara habit. The most important and obvious characteristic feature of the summer flora of Jabel Nafousa is that the number of genera is almost equal to the total number of species, which brings about 1 species/genus. The dominance of Therophytes was expected due to the small amount of rainfall received per year, as well as the extremely hot conditions mainly in the summer time. Based on the total number of collected species, the vegetative cover of Jabel Nafousa in summer is very poor in the vast area of the region.

About the vast area of Jabel Nafousa, the vegetation cover is very poor with 94 species, which is due to the severe climatic conditions of the region. Based on that, the climate is a very important factor affecting the vegetation distribution of the region (Alftisi, 2019). The hard climatic conditions of Jabel Nafousa contribute to the degradation of the vegetation cover which might lead to desertification of the region with low precipitation. Three species were dominant, which are, *Hammada scoparia* belongs to the family *Amaranthaceae*, *Retama raetam* belongs to the family *Fabaceae*, and *Ziziphus lotus* belonging to the family *Rhamnaceae*.

Conclusion

The result of this study showed that the plant species collected and identified from the region of study were capable of growing more or less competitive life under extremely difficult environmental conditions of drought, especially during summertime. Moreover, the little amount of rainfall received in the area per year is more or less going to lead the area of Jabel Nafousa to desertification. The total number of plant species collected from the area of study is not comparable to the vast area of Jabel Nafousa, which is due to extremely hot conditions, especially in summertime. The results of this survey showed that the family Poaceae represents the most sizable family in the area followed by the families *Asteraceae*, *Amaranthaceae*, *Fabaceae*, and *Zygophyllaceae*. With a few exceptions, the number of genera is equal to that of species, this is a clear indication that the vegetation cover of Jabel Nafousa is very poor.

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