Libyan Journal of Ecological & Environmental Sciences and Technology
(LJEEST)

LJEEST
ISSN: 2710-5237
www.srcest.org.ly/jou

DOI: https://doi.org/10.63359/etczp697

Survey of Plant Species in Central Plateau of Al-Batnan, Libya

Hameda, M. Hamad, Sobhia, M.Soliman

ARTICLE INFO

Vol. 7 No. 2 Agusust, 2025

Pages (43- 49)

Article history:
Revised form 17 June 2025
Accepted 03 July 2025

Authors affiliation
Department of Botany, Faculty of Science, Omar El-Mukhtar University, Libya (hameda_h76@yahoo.com)

Keywords:
Survey, central plateau of Al-Batnan, plant species.

ABSTRACT

The main objective of this study was to survey plants in the central plateau of Al-Butnan, the vegetation sampling was carried out between March 2023 to October 2024 with several field trips to the study area, and make a list dealing with the floristic composition. where five regions were randomly selected and all plant species found in them were recorded. 148 species belonging to 110 genera and 38 families were found, all of which are angiosperms, 5 monocotyledonous families and 33 dicotyledonous families, the dominant family was Asteraceae, where 27species have been identified, constituting 18% of the total species, followed by Fabaceae family with 22 species and 15% of the total species, then Chenopodiaceae family with 11 species, i.e. 7% of the total. These species were divided according to their life form into five groups (Therophyte 44%, Chamaephyte 24%, Hemicryptophyte 14%, Phanerophyte 11%, Geophyte7%).

حصر الانواع النباتية في الهضبة الوسطى بالبطنان, ليبيا

حميدة مصطفى السنوسي صبحية مفتاح سليمان

الهدف الرئيسي من هذه الدراسة هو حصر النباتات في الهضبة الوسطى للبطنان، وقد تم أخذ عينات من الغطاء النباتي بين مارس 2023 وأكتوبر 2024 مع عدة زيارات ميدانية لمنطقة الدراسة، وإعداد قائمة تتناول التركيب الزهري. حيث تم اختيار خمس مناطق عشوائيًا وتم تسجيل جميع أنواع النباتات الموجودة فيها. تم العثور على 148 نوعًا تنتمي إلى 110 أجناس و38 عائلة، جميعها من كاسيات البذور و5 عائلات أحادية الفلقة و33 عائلة ثنائية الفلقة، وكانت العائلة السائدة هي المركبة حيث تم تحديد 27 نوعًا، تشكل 18٪ من إجمالي الأنواع، تليها العائلة البقولية بـ 22 نوعًا و15٪ من إجمالي الأنواع، ثم العائلة الرمرامية بـ 11 نوعًا، أي 7٪ من الإجمالي. تم تقسيم هذه الأنواع حسب شكل حياتها إلى خمس مجموعات (النباتات الحولية 44%، النبتات المعمرة القصيرة 24%، النباتات شبه الارضية 14%، النباتات الخشبية 11%، النباتات الارضية 7%).

INTRODUCTION

The identification, designation, and documenting of plant species are all part of floristic studies, which are taxonomic analyses of the flora of a particular region or a sizable piece of it (Keith, 1988; Ilyas *et al*., 2013).
Additionally, the floristic lists generated by these studies may serve as the basis for more in-depth study and are often the only sources of botanical data for a particular area. It may be used, for example, in ecological studies to compare the flora of the same area in other environments or at different periods. (Ferreira *et al*., 2013; Martínez-Calderón *et al*., 2017).
In addition to their socioeconomic significance, studies of floral composition are essential for the conservation of biodiversity and comprehending the variety of plants that occur in a given area. (Heywood, 2004).
The study area is a semi-desert range zone where the predominant vegetation is made up of annuals, shrubs, and sub-shrubs that have evolved to withstand the extreme conditions. The region is known for its semi-desert environment, which is mostly dry with infrequent, erratic rainfall that varies from month to month and year

to year. The existence and spread of vegetation coverage and limited biodiversity in the studied area are largely determined by natural variables such as terrain, arid climate, lack of water supplies, and pad soil characteristics. (El-Barasi & Saaed,2015).
The current study aimed to inventory the various plant species in the area, define them, compile a list of them, and distribute them according to groupings such species, genera, and forms of life.

MATERIALS AND METHODS

Study area:
Al-Batnan Plateau is located in the far east of Libya. It overlooks the Mediterranean Sea and extends in the form of a rectangle in a longitudinal direction from north to south .The western administrative borders of Al-Batnan start from Ain Al-Ghazala in the west, then descend in almost straight line to the Great Sand Sea area .As for its eastern administrative borders, it extends from the east of Al- Burdia, then descends tortuously, then straightens, heading south to the Great Sand Sea area . This study focuses on the central plateau of the Butnan Plateau, which It had a height of 200 meters above sea level and located directly after the coastal area of the plateau, and extends between longitudes 23°-25°E (Figure 1) . (Al-Shaeri, 2002).

Figure (1):Map showing the location of Al-Batnan Plateau in Libya.

Five regions were randomly selected to represent the study area, which are,Ain Qazala, Al-Mrases, Kambout, Qaser Al- Jadi, Al-Burdia (Figure2).

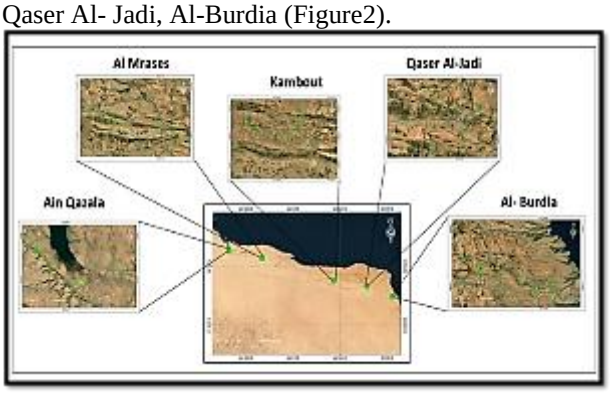


Figure (2):Areas that were randomly selected in the study area.

Climatic data analysis:
Al-Batnan Plateau is characterized by its climate, which is a mixture between desert and semi-desert climate.
Based on climate data for the years (2013-2022), which were analyzed according to various literatures, the average annual rainfall amounted to 109.94, ranging from 46.2 mm in 2014 to 194.2 mm in 2020 (figure3). As for the monthly rainfall rate, it reached its highest levels in January. It reached 34.48 mm, while the months from May to August were almost dry (figure 4).

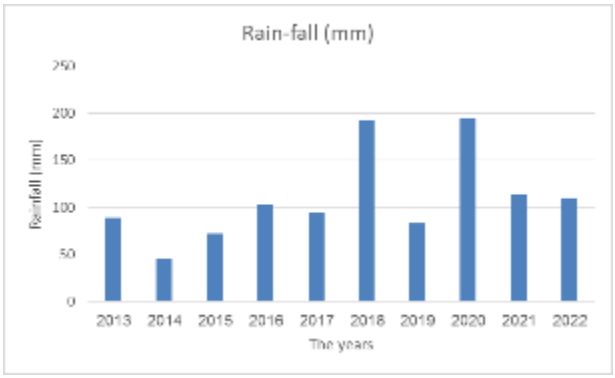


Figure (3): Annual rainfall rate for the years (2013-2022).

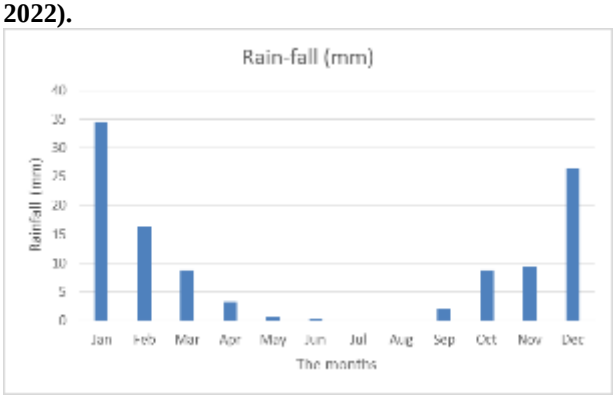
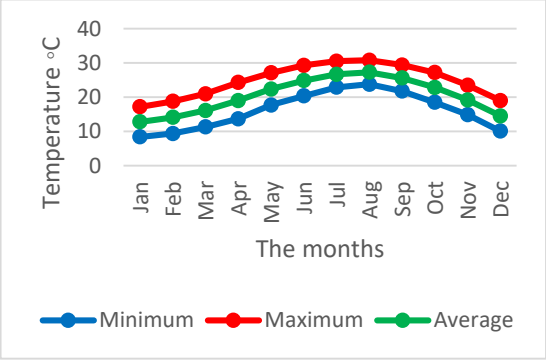


Figure (4): Average monthly rainfall for the years (2013-2022).

Since the area is not more than 200 meters above sea level, there is little effect of the surface features of Al-Batnan Plateau on the temperature. The average maximum temperature for the years (2013-2022) is about 25 degrees Celsius, while the average minimum temperature is 16 degrees Celsius, with a general average of 20 degrees Celsius. (Figure 5) shows the average monthly temperatures for the years (2013-2022), where the average temperature ranged from 12.8 in January to 27.3 in August.



Figure(5): Maximum, minimum and average temperatures for the years (2013-2022).

Sample collection and Identification:

The vegetation sampling was carried out between March 2023 to October 2024 with several field trips to the study area. All plant species found in the five regions were identified according to the Libyan Flora Encyclopedia (Flora of Libya), (Ali & Jafri, 1976- 1977; Jafri & El-Gadi, 1977–1985 and El-Gadi, 1988). and plants were classified into life forms according to (Raunkiaer, 1934). A list representing this data was created**.**

RESULTS

During field visits to the study area, 148 species belonging to 110 genera and 38 families were identified, all of which are angiosperms, 5 of which are monocots and 33 are dicots, table (1).

Table (1): A list of families and their species that were identified in the study area.

1.Monocotyledoneae		
Family	Scientific name	Life form
Alliaceae	*Allium roseum* L.	Geophyte
Araceae	*Arum cyrenaicum* Hruby	Geophyte
Iridaceae	*Iris sisyrinchium* L.	Geophyte
Liliaceae	*Asparagus aphyllus* L.	Geophyte
	Asparagus stipularis Forss	Geophyte
	Asphodelus microcarpus Viv	Geophyte
	Gagea reticulata (Pall) Schult. & Schult.f.	Geophyte
	Urginea maritima (L.) Baker	Geophyte
Poaceae	*Bromus madritensis* L.	Therophyte
	Hordeum vulgare L.	Therophyte
	Lamarckia aurea (L.) Moench	Therophyte
	Lygeum spartum Loefl ex L.	Geophyte
	Schismus arabicus Nees	Therophyte

2.Dicotyledoneae		
Family	Scientific name	Life form
Aizoaceae	*Mesembryanthemum nodiflorum* L.	Therophyte
Anacardiaceae	*Rhus tripartita* (Ucria) Grande	Phanerophyte
Apiaceae	*Eryngium martimum* L.	Geophyte
	Pituranthos tortuosus (Desf.)	Chamaephyte
	Scandix australis L.	Therophyte
Asclepiadaceae	*Caralluma europaea* (Guss.) N.E. Br	Hemicryptophyte
	periploca angustifolia Labill	Phanerophyte
Asteraceae	*Anacyclus monanthos* (L.) Thell.	Therophyte
	Artemisia herba-alba Asso	Chamaephyte
	Atractylis cancellata L.	Therophyte
	Atractylis carduus (Forssk) C. Chr.	Chamaephyte
	Atractylis delicatula Batt. Ex (L.) Chevall.	Therophyte
	Calendula arvensis L.	Therophyte
	Carlina involucrata Poiret	Hemicryptophyte
	Carlina sicula Ten.	Therophyte
	Carthamus divaricatus Beg. & Vacc	Therophyte
	Carthamus lanatus L.	Chamaephyte
	Centaurea alexandrina Delile	Therophyte
	Chamomilla pubescens (Defs) Alavi	Therophyte
	Chrysanthemum coronarium L.	Therophyte
	Crepis vesicaria L.	Therophyte
	Echinops cyrenaicus E. A. Durand & Barratte	Chamaephyte
	Filago desertorum Pomel	Therophyte
	Ifloga spicata (Forssk.) Sch. Bip.	Therophyte
	Koelpinia linearis Pall.	Therophyte
	Launaea nudicaulis (L.) Hook.f.	Therophyte
	Leontodon simplex (Viv) Widder	Therophyte
	Notobasis syriaca (L.) Cass	Therophyte
	Pallenis spinosa (L.) Cass	Hemicryptophyte
	Phagnalon rupestre (L.) Dc	Chamaephyte

	Reichardia tingitana (L.) Roth	Therophyte
	Scorzonera undulata Vahl	Chamaephyte
	Senecio gallicus Chaix	Therophyte
	Varthemia iphionoides Boiss & Blanche	Chamaephyte
Boraginaceae	*Lappula spinocarpos* (Forsk) Asch. Ex Kuntze	Therophyte
Brassicaceae	*Biscutella didyma* L.	Therophyte
	Carrichtera annua (L.) DC	Therophyte
	Didesmus bipinnatus (Defs.) Dc	Therophyte
	Enarthrocarpus pterocarpus (Pers) Dc.	Therophyte
	Matthiola tricuspidata (L.) R. Br.	Therophyte
	Moricandia arvensis (L) DC	Chamaephyte
	Moricandia nitens (Viv.)E.A Durand & Barratte	Chamaephyte
	Rapistrum rugosum (L.) All.	Therophyte
	Sinapis alba L.	Therophyte
	Zilla spinosa (L.) Prantl	Phanerophyte
Capparaceae	*Capparis spinosa* Linn	Hemicryptophyte
Caryophyllaceae	*Gymnocarpos decander* Forssk.	Chamaephyte
	Minuartia geniculata (Poir.) Thell	Chamaephyte
	Silene vivianii Steud	Therophyte
	Spergula fallax (Lowe) E.H.L.Krause	Therophyte
Chenopodiaceae	*Anabasis articulata* (Forssk) Moq	Chamaephyte
	Anabasis oropediorum Maira	Chamaephyte
	Atriplex halimus L.	Phanerophyte
	Atriplex stylosa Viv	Chamaephyte
	Hammada scoparia (Pomel) Iljin	Chamaephyte
	Noaea mucronata (Forssk.) Asch. & Schweinf	Phanerophyte
	Salsola longifolia Forssk	Phanerophyte
	Salsola tetragona Delile	Chamaephyte
	Salsola tetrandra Forssk	Chamaephyte
	Suaeda vera Forssk. Ex J. F. Gmel	Chamaephyte
	Suaeda vermiculata Forssk. Ex J.F.Gmel	Chamaephyte
Cistaceae	*Helianthemum getulum* Pomel	Chamaephyte
Convolvulaceae	*Convolvulus althaeoides* L.	Hemicryptophyte
	Convolvulus arvensis L.	Hemicryptophyte
	Convolvulus dorycnium L.	Hemicryptophyte
Crassulaceae	*Umbilicus intermedius* Boiss	Geophyte
Euphorbiaceae	*Euphorbia dendroides* L.	Phanerophyte
	Euphorbia retusa Forssk.	Hemicryptophyte
Fabaceae	*Astragalus boeticus* L.	Therophyte
	Astragalus schimperi Boiss	Therophyte
	Astragalus stella Gouan	Therophyte
	Lathyrus aphaca L.	Therophyte
	Lathyrus gorgonei Parl	Therophyte
	Lathyrus setifolius L.	Therophyte
	Lotus corniculatus L.	Hemicryptophyte
	Lotus cytisoides L.	Chamaephyte
	Medicago laciniata (L.) Mill	Therophyte
	Medicago littoralis Rohde ex Loisel.	Therophyte
	Medicago polymorpha L.	Therophyte
	Medicago sativa L.	Hemicryptophyte
	Melilotus indicus (L.) All	Therophyte
	Melilotus sulcatus Desf	Therophyte
	Onobrychis crista-galli (L.) Lam.	Therophyte
	Psoralea bituminosa L.	Chamaephyte
	Retama raetam (Forssk.) Webb	Phanerophyte
	Scorpiurus muricatus L.	Therophyte
	Trifolium arvense L.	Therophyte
	Trifolium tomentosum L.	Therophyte
	Trigonella stellata Forssk	Therophyte
	Vicia sativa L.	Therophyte
Frankeniaceae	*Frankenia hirsuta* L.	Hemicryptophyte
Fumariaceae	*Fumaria densiflora* DC.	Therophyte
Geraniaceae	*Erodium glaucophyllum* (L.) L′ Her.	Chamaephyte
	Erodium hirtum Willd	Hemicryptophyt
	Erodium laciniatum (Cav.) Willd	Therophyte

	Geranium rotundifolium L.	Therophyte
Globulariaceae	*Globularia arabica* Jaub & Spach	Chamaephyte
Lamiaceae	*Ajuga iva* (L.) Schreb.	Chamaephyte
	Ballota pseudodictamnus (L.) Benth	Chamaephyte
	Micromeria micropylla (D'Urv.) Benth	Chamaephyte
	Phlomis floccosa D. Don	Phanerophyte
	Salvia aegyptiaca L.	Hemicryptophyt
	Salvia lanigera Poir	Chamaephyte
	Salvia verbenaca L.	Hemicryptophyt
	Teucrium fruticans L.	Phanerophyte
	Teucrium polium (Decne) Aschers	Chamaephyte
	Thymus capitatus (L.) Hoffmanns. & Link	Phanerophyte
Malvaceae	*Malva sylvestris* L.	Chamaephyte
Papaveraceae	*papaver hybridum* L.	Therophyte
Plantaginaceae	*Plantago albicans* L.	Hemicryptophyt
	Plantago arenaria Waldst. & Kit	Therophyte
	Plantago crypsoides Boiss.	Therophyte
	Plantago notata Lag	Therophyte
	Plantago ovata Forssk	Therophyte
Plumbaginaceae	*Limonium cyrenaicum* (Rouy) Brullo	Hemicryptophyt
	Limoniastrum monopetalum (L.) Boiss	Chamaephyte
	Limonium pruinosum (L.) Chaz	Hemicryptophyt
	Limonium thouinii (Viv.) Kuntze	Therophyte
	Limonium tubiflorum Del Kuntze	Hemicryptophyt
Polygonaceae	*Emex spinosa* (L.) Campd	Therophyte
	Polygonum equisetiformis Sm	Hemicryptophyt
Primulaceae	*Anagallis arvensis* L.	Therophyte
Ranunculaceae	*Adonis dentate* Delile	Therophyte
	Ranunculus cyclocarpus Pamp	Therophyte
Rhamnaceae	*Rhamnus oleoides* L.	Phanerophyte
	Ziziphus lotus (L.) Lam	Phanerophyte
Rosaceae	*Sanguisorba minor* Scop.	Hemicryptophyt
Rubiaceae	*Galium setaceum* Lam	Therophyte
Solanaceae	*Lycium europaeum* L.	Phanerophyte
Tamaricaceae	*Reaumuria hirtella* Jaub. & Spach	Chamaephyte
	Reaumuria vermiculata L.	Chamaephyte
	Tamarix aphylla (L.) H.Karst	Phanerophyte
Thymelaeaceae	*Thymelaea hirsuta* (L.) Endl	Phanerophyte
Zygophyllaceae	*Fagonia sinaica Boiss*	Hemicryptophyt
	Peganum harmala L.	Chamaephyte

According to the list of plant species in the study area, Which is represented in the figure (6) the dominant family is Asteraceae family, where 27 species have been identified, constituting 18% of the total species, followed by Fabaceae family with 22 species and 15% of the total species, then Chenopodiaceae family with 11 species, i.e. 7% of the total, there are also two families (Brassicaceae, Lamiaceae) with 10 species, which constitute 14% of the total species, four families (Liliaceae, Plantaginaceae, Plumbaginaceae, Poaceae) with 5 species, which represent 14%, two families (Caryophyllaceae, Geraniaceae) with 4 species, which represent 5%, three families (Apiaceae, Convolvulaceae,Tamaricaceae) with three species, which represent 6%, and six families (Asclepiadaceae, Euphorbiaceae, Polygonaceae, Ranunculaceae, Rhamnaceae, Zygophyllaceae) with two species represents 8% and nineteen families (Aizoaceae, Alliaceae, Anacardiaceae, Araceae, Boraginaceae, Capparaceae, Cistaceae, Crassulaceae, Frankeniaceae, Fumariaceae, Globulariaceae, Iridaceae, Malvaceae, Papaveraceae, Primulaceae, Rosaceae, Rubiaceae, Solanaceae, Thymelaeaceae) with one species and represents 13% of the total species.

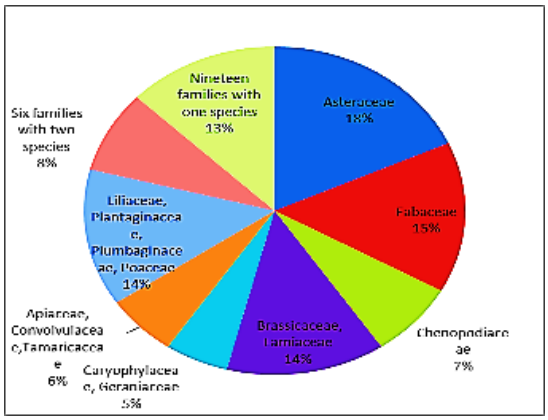


Figure (6): Percentage of species representing each family.

Table (2) and figure (7) show the life form of the plant species recorded in the study area according to (Raunkiaer, 1934), which were divided into five groups, and the largest percentage was for annual plants (Therophyte), with 65 species recorded at a rate of 44%, followed by (Chamaephyte), which included 35 species at a rate 24%, then Hemicryptophyte, Phanerophyte, and Geophyte, which included 21 (14%), 16 (11%), and 11(7%) respectively.

Table (2): showing the life form and the number of species it includes.

The life form	Number of registered species
Therophyte	65
Chamaephyte	35
Hemicryptophyte	21
Phanerophyte	16
Geophyte	11

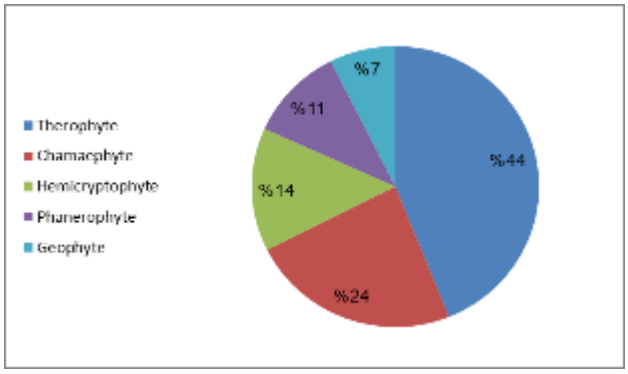


Figure (7):The life form and the percentage of species it includes.

DISCUSSION

Floristic composition and vegetation analysis studies were becoming increasingly important to provide critical data for understanding biodiversity and ecosystem functioning in order to preserve the biodiversity in these ecosystems (Heywood, 2004).

There are 2,088 vascular plant species in Libya, distributed across 844 genera and 145 families (Ali and Jafri,1976-1977; El-Gadi, 1989; and Klopper *et al*., 2007) , in comparison, the present study recorded a total of 148 vascular plant species, belonging to 110 genera and 38 families. This means that the flora of Al-Butnan plateau contributes 7.09% of the total plant species, 13.03% of the total genera and 26.20 % of the total families in the Flora of Libya. The results also showed the dominance of dicotyledons, which represented 33 families, followed by monocotyledons, which represented five families. The most widespread families was Asteraceae with 27 species ,then Fabaceae family with 22 species, these results are consistent with what was reached by Arwag (2025), the dominance of Asteraceae family in the study area is attributed to a combination of morphological and ecological characteristics. Notably, the aggregation of its flowers into capitulum inflorescences enhances pollination efficiency, furthermore, most of its species are herbaceous and annual, which allows for rapid growth and reproduction and the relatively low level of competition among species within the family also contributes to its widespread presence, the Fabaceae comes second in abundance, mainly due to its strong competitiveness, which is partly related to its relatively large seed size, a feature that promotes successful germination (Saad, 1984), these families are also distinguished by their high degree of adaptation to the Mediterranean climate (Mahklouf & Al-Sghair, 2016), and the most dominant genera in the study area was Plantago from Plantaginaceae family, which was represented by five species, no plant species belonging to Pteridophytes or Gymnosperms were recorded in the study area and these results are similar to those reached by Arwag (2022). According to the life form, the species recorded in the study area can be divided into five groups (Therophytes 44% , Chamaephytes 24% , Hemicryptophtes 14% , Phanerophytes 11% , Geophytes 7%), therefore, annual plants are the most dominant in the region, and their life cycles are linked to the rainy season, this was confirmed by (Cain, 1950), who also emphasized that weather factors are one of the most important factors directly influencing life form, this can be explained by the length of the dry period during the year, which begins from the second half of February and ends at the end of November. This was confirmed by (Whittaker, 1975), who stated that annual plants prevail in dry areas. Since annual plants only grow during rainfall periods and for short periods of the year, this indicates the poor quality and quantity of vegetation cover in this ecosystem, in contrast, perennial plants do not experience such sharp fluctuations in their presence or quantity over time, but rather serve as a semi-permanent framework for vegetation cover (El-Barasi & Saaed, 2015).

CONCLUSION

The current study aimed to the initial inventory of the types of plants in the region defining them, preparing a list of them, and distributing these plants within groups such as species, genera, and different life forms. The methods developed during the study can be used as a basis for carrying out similar studies and for helping to devise management and conservation programs. In the study area, the major vegetation types, their composition and biodiversity were identified.

REFERENCES

Ali, S., & Jafri, S. (1976–1977). *Flora of Libya*. Vols. 1–24, Tripoli (Libya): Department of Botany, Faculty of Science, Tripoli University (formerly Al-Fateh University). DOI: org/10.1080/00837792.1979.10670168

Al-Shaeri, M.S. (2002). *Natural vegetation cover in the northeastern coast (Al-Butnan Plateau)*. Al-Thawra Press. [In Arabic].

Arwag, O. A. F. (2022). The natural vegetation cover of Al-Dafna plateau in Northeast Tobruk, Libya. *The Libyan International Journal*, 1-31. DOI: 10.37376/glj.vi62.4651

Arwag, O. A. F. (2025). Floristic study and plant diversity of Wadi Abo Alakmal basin west Tobruk city in North-eastern Libya. *Bani Waleed University Journal of Humanities and Applied Sciences*. *10*(2), 356-371. DOI: 10.58916/jhas.v10i2.750

Cain, S. A. (1950). Life-forms and phytoclimate. *Botanical review, 16*(1), 1-32.DOI:10.1007/BF02879783

El-Barasi, Y. M., & Saaed, M. W. B. (2015). Land use and disturbance effects on the natural vegetation of Daphna range zone (North Eastern part of Libyan coast). *International Journal of Environment and Water, 4*(2), 89-103. DOI: https://www.researchgate.net/publication/294682344

El-Gadi, A. A. (1988). *Flora of Libya*. Department, Faculty of Sci., Tripoli Univ., Libya. Vol.145.

Ferreira, E. V. R., Prata, A. P. D. N., & Mello, A. A. D. (2013). Floristic list from a caatinga remnant in Poço Verde, Sergipe, Brazil. DOI: 10.15560/9.6.1354

Heywood, V. H. (2004). Modern approaches to floristics and their impact on the region of SW Asia. *Turkish Journal of Botany*, 28(1), 7-16.

Ilyas, M., Qureshi, R., Arshad, M., & Mirza, S. N. (2013). A Preliminary checklist of the vascular flora of Kabal Valley, Swat, Pakistan. *Pak. J. Bot*, 45(2), 605-615.DOI: https://www.researchgate.net/publication/236676651

Jafri, S. M., & El-Gadi, A. A. (Eds) (1977-1985). *Flora of Libya*. Department, Faculty of Sci., Tripoli Univ., Libya. Vol.30- 118.

Keith, D. A. (1988). Floristic lists of New South Wales (III). *Cunninghamia*, 2(1), 39-73.

Klopper, R. R., Gautier, L., Chatelain, C., Smith, G. F., & Spichiger, R. (2007). Floristics of the angiosperm flora of Sub-Saharan Africa: An analysis of the African Plant Checklist and Database. *Taxon, 56*(1), 201-208. DOI: 10.2307/25065751

Mahklouf, M. H., & Al Sghair, F. G. (2016). Biodiversity and Floristic Study of Al-Hdaba Treatment Plant Tripoli–Libya. *American Journal of Life Science Researches, 4*(3), 101-103. DOI: 10.21859/ajlsr-040307

Martínez-Calderón, V. M., Siqueiros-Delgado, M. E., & Martínez-Ramírez, J. (2017). Checklist of the genus Quercus (Fagaceae) of Aguascalientes, México. Check List, 13(1), 2045-2045.DOI: 10.15560/13.1.2045

Raunkiaer, C. (1934). The life forms of plants and statistical plant geography; being the collected papers of C. Raunkiær. *The life forms of plants and statistical plant geography; being the collected papers of C. Raunkiaer*.

Saad, S. E. (1984). *Flowering Plants (Genesis-Evolution- Classification)*. [6th Ed] Dar Al-Fikr Al-Arabi, Cairo. [In Arabic]

Whittaker, R.H. (1975). Communities and Ecosystems. 2ed . Macmillan Publishing Co.NewYork .