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Vegetation Analysis of Cyrene *Campus apollo* Shahat AL-Jabal AL-Akhdar, Libya

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ABSTRACT

The present study addressed the analysis of the natural vegetation in the Cyrene (campus apollo) ShahatAL-Jabal AL-Akhdar, Libya, by using the quadrate method. The diversity of vegetation at the site was estimated using nine quadrates. The dominant plant species were determined by the Importance Value Index (IVI) and were the most dominant species; *Phlomis floccosa* D. (IVI, 33.78%), *Geranium molle* L. (IVI,18.46%), and *Sarcopoterium spinosum* (L.) Spach. (IVI, 17%). The spatial distribution of vegetation in the study area was also studied by taking the (IVI) of each species within each quadrat and applying it to the Classification and ordination of communities, and by entering the data of the (IVI) for 9 quadrats and applying it to a Community Analysis Package (CAP) Program for the Classification and ordination of communities, and by using a technique Two-Way Indicator Species Analysis (TWINSPAN), which includes the Dendrogram and Detrended Correspondence analysis (DCA), done classification of vegetation in the study area into two communities, that according to the similarity between the quadrats and the prevailing dominance of the species in each community. Climatic variables were also taken (rainfall, maximum and minimum temperature), a ten-year average was calculated via data obtained from the Libyan National Meteorological Center, physical and chemical analyzes of soil was also carried out.

تحليل الغطاء النباتي في قورينا (حرم ابولو) شحات ، الجبل الاخضر ، ليبيا

إنصاف حسين دخيل حميدة مصطفى السنوسي رانيا فرج محمد ايناس محمد سعد.

تناولت الدراسة الحالية تحليل الغطاء النباتي الطبيعي في منطقة القيروان (حرم أبولو) شحات الجبل الأخضر، ليبيا، باستخدام طريقة المربعات. تم تقدير تنوع الغطاء النباتي في الموقع باستخدام تسع مربعات. تم تحديد الأنواع النباتية السائدة من خلال مؤشر قيمة الأهمية (IVI) وكانت الأنواع الأكثر انتشارًا؛ *Phlomis floccosa* D. (IVI, 33.78%) ، *Geranium molle* L. (IVI,18.46%) ، و *Sarcopoterium spinosum* (L.) Spach. (17%). كما تمت دراسة التوزيع المكاني للغطاء النباتي في منطقة الدراسة من خلال إدخال بيانات (IVI) وتطبيقها في برنامج حزمة التحليل المجتمعي (CAP) لتصنيف وتنسيق المجتمعات، وباستخدام تقنية تحليل الأنواع ذات المؤشر الثنائي (TWINSPAN)، والتي تتضمن تحليل Dendrogram وتحليل المراسلات المنحرفة (DCA)، تم تصنيف الغطاء النباتي وتم تقسيم منطقة الدراسة إلى مجتمعين وذلك حسب التشابه بين المربعات وسيادة النوع في كل مجتمع. كما تم أخذ المتغيرات المناخية (هطول الأمطار، درجة الحرارة العظمى والصغرى)، وتم حساب متوسط العشر سنوات من خلال البيانات التي تم الحصول عليها من المركز الوطني للأرصاد الجوية الليبية، كما تم إجراء التحاليل الفيزيائية والكيميائية للتربة.

INTRODUCTION

The term Vegetation describes the number, distribution, size, and relative importance of plant species. Recent years have seen an increase in the importance of vegetation study and its environmental elements, especially for managing and conserving plant diversity (Ali, 2008). Vegetation analysis is important as it gives an idea of the plant species present in the area and the problems that affect them, such as extensive grazing, human use, and drought. The study of vegetation is taken into account as a reflection of climatic and edaphic factors such as soil and rain, and a crucial component in the biodiversity and heritage value of natural environments. It is also feasible to determine the population's influence by looking at the various behaviors that they engage in successive periods of time. (Bodin,2010). Knowing the nature of the species, dominant plants involved in the makeup of their plant communities, and accurately assessing the significance of these species allow to demonstrate the significance of researching vegetation. Identification of the ecological groupings that make up a plant community, identification of the species of plants, and identification of the function of a particular environment all contribute to a better understanding of the interplay between plants and environment. (Azone & Issa,2016). An essential component of the plant groupings that contribute to diversity is vegetation of all kinds (Al-Tellawi,1989), and the existence of plant species depends on a number of conditions, including topographic characteristics like slope and elevation, climate, and soil components, all of which are interrelated and are of major importance. (Koppad & Janagoudar,2017).

Al-Jabal Al-Akhder is considered the richest location in vegetation with the greatest number of species, with almost 90% of the plant species in Libya (Boulos,1972). Cyrene is located about 12 km east of the city of Al-Bayda, in northeastern Libya, it is found on the second terrace of Al- Jabal Al- Akhdar. Local researchers recently conducted some surveys examined the AL-Jabal AL-Akhdar area (North-Eastern section of Libya) due to its flora, vegetation cover, biodiversity, climate, and ecological relevance. (Mukassabi et al., 2012; Al-Traboulsi and Alaib, 2021; Omar et al., 2021). The current study aimed to vegetation analysis in AL-Jabal AL-Akhdar, and these records not only provide an important baseline for the floristic elements, but they also provide authoritative information about the distribution of these species. However, to our knowledge, few studies have dealt with vegetation analysis in relation to floristic composition and habitat variation in study area.

Materials and Methods

The study area is located in the Northeast of Libya about 12 Km east of the city of Al-Bayda, between Latitude 32°49´23.952 ´N And longitude 021°51´11.1888 ´E, it is found on the second terrace of Al-Jabal Al-Akhdar, at an elevation is between (555: 578 m). (Fig. 1).

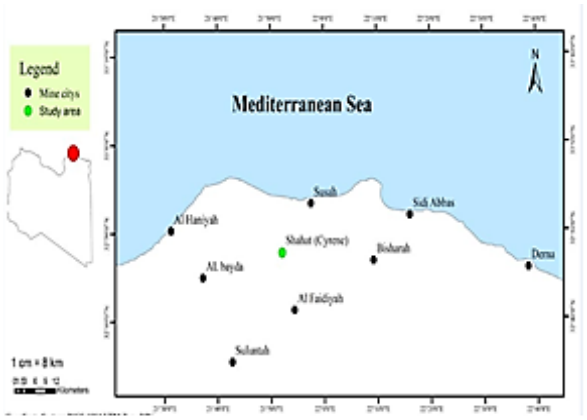

Fig. (1): The study area

Climatic data analysis:

The data of climatic factors were obtained and collected from Libyan National Center of Meteorology for ten consecutive years. They were analyzed according to different literatures depending on the availability of precipitations and temperatures, a ten-year average shows the amount of precipitation is high especially in December, January, and February, the dry period extends from June to August, a ten-year average maximum temperature was 23 °C and the average minimum temperature was 15 °C, the highest temperatures were recorded in June, July and August, where the maximum temperatures were (28.53°C, 29.99°C, and 30.33 °C), respectively, while the minimum temperatures were (19.16°C, 21.37°C, and 22.14°C), respectively, the lowest temperatures were recorded during December, January, and February, where the maximum temperatures were (16.39°C, 17.49°C, and 15.82°C), while the minimum temperatures were (11.36°C, 9.37°C, and 9.33°C). (Fig. 2).

Vegetation analysis:

The vegetation sampling was carried out during the spring season in the year 2023, when this period represented the optimal flowering season for the most plants with several field trips to the study area for vegetation sampling, the vegetation on the study area is discontinuous with patchy distribution, therefore,

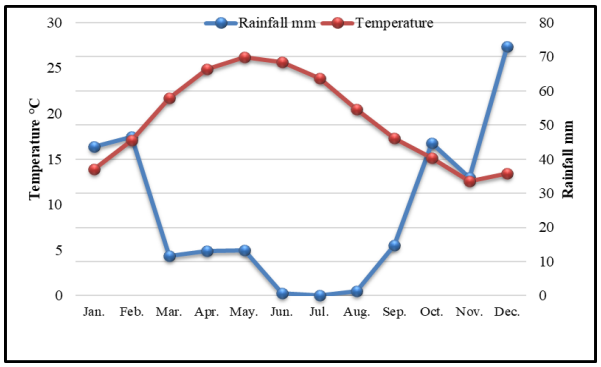

Fig. (2): Mean monthly variation of temperatures °C and rainfall (mm) during the period (2010: 2019).

the distribution and number of sampling quadrats were based on the floristic and ecological variability.The quadrat method was used to measure the vegetation transects were made along the study area, between a transect and a transect of (100 m), and they were three transects and were distributed within these transects nine quadrats measuring (each of 5m×5m), (Kent & Coker, 1992). All plant species were recorded and identified in the Silphium herbarium, Department of Botany, College of Science, Omar Al-Mukhtar University according to the Libyan Flora Books. Relative values of density, frequency and cover were calculated for all species and summed up to give an estimate of its importance value (IV) in each stand out of 300 (Ludwig & Reynolds,1988) for the different species. And was used Global Positioning System (GPS) device, to the locations of the quadrates were determined. (Table 1).

Transects	T1				T2			T3	
Quadrates	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q1	Q2
Northern latitude	32°49 13	32°49 13	32°49 14	32°49 16	32°49 23	32°49 22	32°49 21	32°49 26	32°49 25
Eastern latitude	21°51 12	21°51 12	21°51 13	21°51 16	21°51 10	21°51 18	21°51 18	21°51 8	21°51 3

Table (1): Coordinates of quadrates in study area.

Soil analysis:

Soil samples in study area were collecting from the two places of different elevations, the first elevation about 578 meters, and the second elevation about 555 meters. Soil samples were collected at a depth of (0-30 cm). The

soil was then dried in the drying oven at a temperature not exceeding 30-40, then grind the soil and pass it through a 2 mm diameter sieve. A number of physical and chemical soil analysis were conducted e.g. electrical conductivity (EC), (Corwin & Lesch. 2003), hydrogen ion concentration pH (Peech,1965) cylinder method was used to determine the bulk density (ρb), (Blake &Hartge,1986), organic matters (OM), anions were also determined by titration method, carbonates (CO3-2), bicarbonates (HCO3-1), (Richards,1954), and chloride (Cl-1) by the Mohr method (Richards,1954). and by titration method, were determination soluble cations in soil extract, calcium (Ca+2), and magnesium (Mg+2) by the Versenate method. (Richards,1954), and were determination of sodium (Na+1) potassium(K+1) by flame photometer (Richards,1954).

Data analysis.

Classification and ordination of communities (stands) following two trends of multivariate analysis, the applied classification technique here was the (TWINSPAN), a CAP Program which includes the Dendrogram and (DCA), (Henderson and Seaby, 1999). Excel program Version 2019 was used in the organization and presentation of data statistically.

Results and Discussion

Vegetation analysis.

Scientists consider the (IVI) one of the most realistic indicators of the expression of vegetation, was measured to 71 species, that were recorded in 9 quadrats distributed over three Transects, it was found that it is the most dominant species in the study area, Phlomis floccosa D. (IVI, 33.78) represented by 11%, Geranium molle L. (IVI, 18.46) with 6%, and Sarcopoterium spinosum (L.) Spach. (IVI, 17) at the rate of 6%. (Fig. 3).

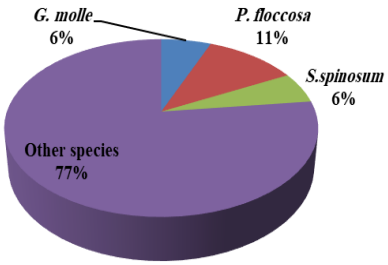

Fig. (3): Percentage of dominant species in the area

And by entering the data of the (IVI) for 9 quadrats and applying it to a CAP Program for the Classification and ordination of communities, and by using a technique (TWINSPAN), which includes the Dendrogram and (DCA), done classification of vegetation in the study area into two communities, that according to the similarity between the quadrats and the prevailing dominance of the species in each community, (Fig. 4).

Whereas: 1.Adonis microcarpa DC., 2. Adiantum capillus-veneris L., 3. Allium roseum L., 4. Anagallis arvensis L. , 5. Anchusa hybrid Ten., 6. Anthyllis

tetraphylla L., 7. Arisarum vulgare Tag.Tozz., 8. Arum cyrenaicum Hruby., 9. Bellis sylvestris Cyro., 10. Bellevalia mauritanica L. , 11. Biscutella didyma L., 12. Borago officinalis L., 13. Centranthus calcitrapae (L.) Dufresne., 14. Cerinthe major L., 15. Chrysanthemum coronarium L., 16. Cynara cyrenaica Weilla., 17. Cynoglossum cheirifolium L., 18. Echium sabulicola. Pomel.Nouv., 19. Euphorbia dendroides L., 20. Evax contracta Boiss., 21. Fedia cornucopiae (L.) Gaertner., 22. Galium aparine L., 23. Geranium molle L., 24. Helichrysum stoechas (L.) Moench., 25. Helichrysum stoechas (L.) Moench., 26. Lathyrus gorgonei Parl., 27. Lathyrus aphaca L., 28. Leontodon tuberosus L., 29. Lotus edulis L., 30. Malva nicaeensis All., 31. Mercurialis annua L., 32. Micromeria nervosa. Desf., 33. Ononis natrix L.,34. Onopordum cyrenaicum Maire & Weiller., 35. Origanum cyrenaicum Beg., 36. Parietaria judaica L., 37. Parnychia arabica (Linn.)DC. , 38. Phagnalon rupestre L., 39. Phlomis floccosa D., 40. Picris altissima Delile Descr., 41. Pimpinella peregrina L., 42. Pistacia lentiscus L., 43. Poa annua L., 44. Poa trivialis L., 45. Polygonum balansae Boiss., 46. Potentilla reptans L. , 47. Ranunculus asiaticus L., 48. Ranunculus bullatus L., 49, Ranunculus cyclocarpus Pamp.,50. Ranunculus trilobus Desf., 51. Romulea bulbocodium (L.) Seb. & Mauri., 52. Rhamnus oleoides L., 53. Rumex pulcher L., 54. Sanguisorba minor Scop.,55. Sarcopoterium spinosum (L.) Spach., 56. Scrophularia canina L.,57. Senecio leucanthemifolius Poiret., 58. Sinapis flexuosa Poiret. ,59. Stachys tournefortii Poiret., 60. Scandix pectin-veneris L., 61. Sonchus oleraceus L.,62. Tetragonolobus purpureus Moench., 63. Thapsia garganica L., 64. Trifolium tomentosum L., 65. Trifolium campestre Schreb. 66. Tyrimnus leucographus (L.) Moench., 67. Umbilicus horizontalis (Guss.) DC., 68. Urginea maritima (L.) Baker., 69. Verbascum sinuatum L., 70. Veronica anagallis-aquatica L., 71. Vicia sativa L.

Community A: This includes the community of eight similar quadrates (T1Q1, T1Q2, T1Q3, T1Q4,T2Q1, T2Q2,T3Q1,T3Q2) , the quadrates this community were distributed in the elevation range of about (578 m), the dominant species at this community was P. floccosa this species is which attained the highest (IVI) with (287.8) the indicator species were according to dominance respectively, S. spinosum, Cynara cyrenaica Weilla., Lotus edulis L., Evax contracta Boiss., Bellis sylvestris Cyro., Scandix pectin-veneris L., Ranunculus bullatus L., Vicia sativa L., Romulea bulbocodium (L.) Seb. & Mauri., Leontodon tuberosus L., Pistacia lentiscus L., Umbilicus horizontalis (Guss.) DC., and Onopordum cyrenaicum Maire & Weiller. with (IVI) ranged from (287.8): (33.57).

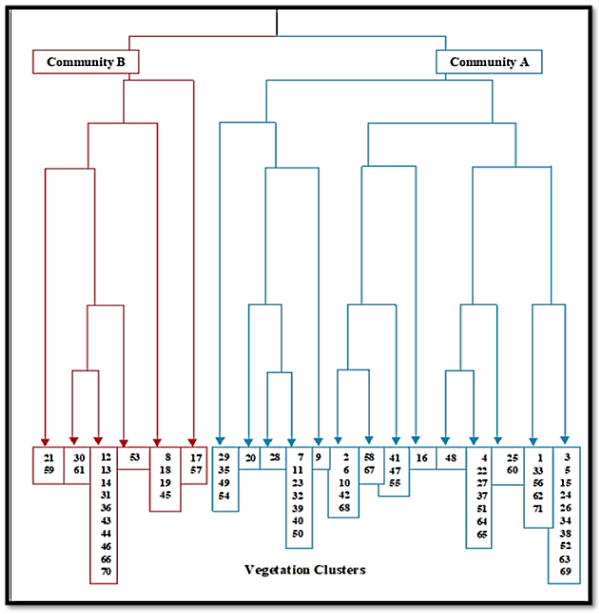

Fig. (4): Two Way Indicator Species Analysis (TWINSPAN) dendrogram of the 9 quadrates stands based on the importance values of the 71 dominant species, arranged alphabetically.

Community B: This community is represented by one quadrate (T2Q3). The quadrate in this community is located at an elevation range of about (555 m). The dominant species in this community was Arum cyrenaicum Hruby. (46.54). The indicator species were Senecio leucanthemifolius Poiret., Malva nicaeensis All., Poa annua L., Stachys tournefortii Poiret., Rumex pulcher L., and, with (IVI) ranged from (46.54) to (14,9). (Table 2).

On the other hand, the application of (DCA) ordination on the vegetation data of 71 species confirms the segregation of two vegetation communities However, there was an overlapping in species between communities (A) and (B), in the middle of the DCA diagram. (Fig. 5).

Analysis (DCA) ordination confirms on the segregation of two vegetation communities and that was on the data of 71 species. However, there was an overlapping in species between communities (A) and (B), in the middle of the DCA diagram. Where (DCA) shows the presence of 36 species specific to the community A , Adonis microcarpa DC., Adiantum capillus-veneris L., Allium roseum L., Anagallis arvensis L., Anchusa hybrid Ten., Anthyllis tetraphylla L., Bellevalia mauritanica L., Chrysanthemum coronarium L., Cynara cyrenaica Weilla., Galium aparine L., Helichrysum stoechas(L.) Moench., Hypericum triquetrifolum Cyro., Lathyrus gorgonei Parl., Lathyrus aphaca L., Ononis natrix L., Onopordum cyrenaicum Maire & Weiller., Paronychia arabica (Linn.)DC., Phagnalon rupestre L., Pimpinella

peregrina L., Pistacia lentiscus L., Ranunculus asiaticus L., Ranunculus bullatus L., Rhamnus oleoides L., Romulea bulbocodium(L.) Seb. & Mauri., S. spinosum., Scrophularia canina L., Sinapis flexuosa Poiret., Scandix pectin-veneris L., Tetragonolobus purpureus Moench., Thapsia garganica L., Trifolium tomentosum L., Trifolium campestre Schreb., Umbilicus horizontalis (Guss.) DC., Urginea maritima (L.) Baker., Verbascum sinuatum L., Vicia sativa L.

Table (2): Floristic features of the two communities' vegetation clusters (A, B). The numbers in brackets represent the importance value (out of 300) of each species

Features	Community	
	A	B
No. of quadrates	8	1
Total number of species	61	35
Dominant species	*P. floccosa*. (287.8).	*A. cyrenaicum*. (46.54).
Important associated species	*S. spinosum* (154.8), *Cynara cyrenaica* Weilla (110.5)., *Lotus edulis* L. (101.47), *Evax contracta* Boiss. (100.3), *Bellis sylvestris* Cyro.(98.2), *Scandix pectin-veneris* L(73.9)., *Ranunculus bullatus* L(51.47)., *Vicia sativa* L.(50.3), *Romulea bulbocodium* (L.) Seb. & Mauri. (49.4), *Leontodon tuberosus* L. (45.12), *Pistacia lentiscus* L. (40.8), *Umbilicus horizontalis* (Guss.) DC. (39.33), and *Onopordum cyrenaicum* Maire & Weiller. (33.57)	*Senecio leucanthemifolius* Poiret. (40.9), *Malva nicaeensis* All. (22.01), *Poa annua* L. (19.6), *Stachys tournefortii* Poiret. (15.6), *Rumex pulcher* L. (14.9).
Elevation (m)	578	555

There are also special 10 species in the community B, Borago officinalis L., Cerinthe major L., Centranthus calcitrapae (L.) Dufresne., Mercurialis annua L., Parietaria judaica L., Poa annua L., Poa trivialis L., Potentilla reptans L., Tyrimnus leucographus (L.) Moench., Veronica anagallis-aquatica L. And 25 species are an overlapping of between communities A and B, Arisarum vulgare Tag.Tozz., A. cyrenaicum., Bellis sylvestris Cyro., Biscutella didyma L., Cynoglossum cheirifolium L., Echium sabulicola. Pomel.Nouv., Euphorbia dendroides L., Evax contracta Boiss., Fedia cornucopiae (L.) Gaertner., G. molle., Leontodon tuberosus L., Lotus edulis L., Malva nicaeensis All., Micromeria nervosa. Desf., Origanum cyrenaicum Beg., P. floccosa D., Picris altissima Delile Descr., Polygonum balansae Boiss., Ranunculus cyclocarpus Pamp., Ranunculus trilobus Desf., Rumex pulcher L., Sanguisorba minor Scop., Senecio leucanthemifolius Poiret., Stachys tournefortii Poiret., Sonchus oleraceus L.

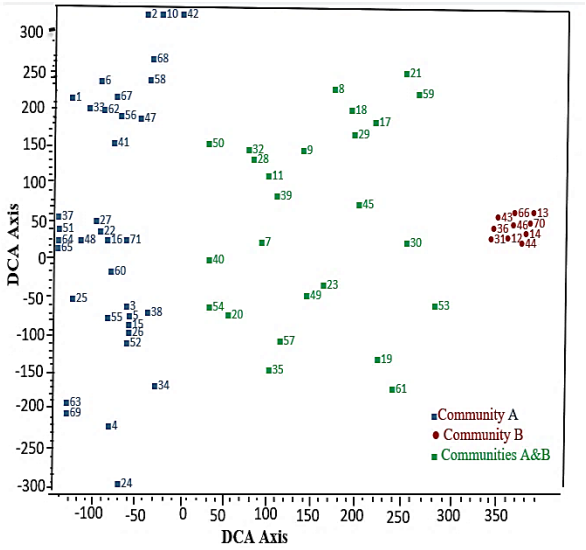

Fig. (5): Detrended Correspondence Analysis (DCA) ordination diagram of stands with vegetation communities from TWINSPAN classification of the vegetation based on importance value in for 71 species.

Soil analysis:

Soil samples were collected from two communities each of them was located at a different elevation, community A was about (578 m), and community B was about 555 m). Through the soil texture triangle, it was clay soil in each of the two communities was the bulk density for community B was higher than community A, as for moisture content, community B was much higher than community A. Was pH analysis in the soil is alkaline in both communities and electrical conductivity was not high in either community, with a little higher in community B than in community A, the results showed that calcium carbonate was very high, especially in community B. There was also a clear increase in the percentage of organic matter in both communities, especially in community B. total nitrogen appeared at an average in both communities with a little higher in community B. The results of the analysis titration for the elements showed that all elements were higher in community B compared to community A. (Table 3).

The correlation coefficient (r) between the different soil variables in the sampled communities, was in (Table 4). It has been found that most soil variables have a strong positive correlation with other soil variables such as, with the exception of sand and pH. Whereas sand shows a strong negative correlation with all soil variables except pH, shows a positive correlation (r = 0.545).

Table (3): The Soil analysis of communities (A & B).

Soil analysis		Community A.	Community B.
Sand (%)		23.13	21.04
Clay (%)		49.73	51.82
Silt (%)		27.14	27.14
Soil Texture		C	C
Bulk density(**ρ**d) g/cm		1.2	1.4
Moisture Content (%)		1	11
PH		7.93	7.95
E.C ms\cm		0.18	0.34
Total N Mlg/L		12.03	13.53
Available. P Mlg/L		6.6224	7.5214
OM (%)		6.7	8.5
CaCO3 (%)		45.50	55.27
Cations, meq/100g	Ca+2	7.5	10
	Mg+2	3.25	5
	Na+	3.442	17.628
	K+	1.769	6.332
Anions, meq/100g	Cl-	20.25	37.5
	HCO3 -	4	5
	CO3-	0	0

As for pH, it shows a negative correlation with the rest of the soil variables, as available phosphorus (r = -0.431), electrical conductivity (r = -0.445), and HCO3 (r = -0.795) as for carbonates and silt, they have a simple incorporeal correlation.

DISCUSSION

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which is located at a higher elevation, we observe clear variation in (IVI) for species, where the value of (IVI) for certain species was very large compared to the rest of the species, which carries (IVI) low, P. floccosa. (287), S. spinosum. (154.8), compared to Onopordum cyrenaicum Maire & Weiller. (33.6), Umbilicus horizontalis (Guss.) DC. (39.3) and this led to the dominance of species at the expense of other species. In contrast to community A, we find that in community B, which was located at a lower altitude, where most species existed homogeneously with (IVI) ranged from (46.54) to. (14,9), and there was no significant dominance of one species at the expense of another. The results of the study showed that altitude was one of the most important physiographic attributes that have extreme impacts on the distribution, growth, form, and structure of species and topographic and climatic conditions vary sharply with a slight change in altitude (Kharkwal et al., 2005). The study showed that the amount of precipitation is high, especially in December, January and February. Similar results have been reported in previous studies. (Al-Traboulsi & Alaib, 2021), distinctive topography of the study area in terms of altitude increased the chances of receiving rain, giving it a humid climate. This led to an increase in the quality of the soil, as it had a clay texture rich in organic matter due to the high amount of rain. It agreed with the results (Habel et al., 2019). as the quality of the physical and chemical properties of soil reflects the diversity and density of vegetation cover. The soil

was clayey in both communities in the study area, with a slight increase in the percentage of clay in community A. cyrenaicum, which represents a lower height than community P. floccosa, which was about (23 m) higher than community A. cyrenaicum, as most of Al-Jabal Al-Akhdar soils are clayey, (Hafiz, 2007). It was noted from the results of calcium carbonate analysis a clear rise in both communities. It was attributed to the formation of the mother stone of the study area from the limestone (Omar Al-Mukhtar University, 2005).

AL-Jabal AL-Akhdar has been the focus of human attention and ancient civilizations because of its unique and diverse vegetation (Alzerbi & Alaib,2017). Floristic composition and vegetation analysis studies were becoming increasingly important to provide important critical data for understanding biodiversity and ecosystem functioning in these areas (Heywood, 2004). Scientists consider the (IVI), one of the most realistic indicators in the study of vegetation especially when using dominance rather than abundance this was to give more accurate results (Curtis & Mcintosh, 1951; Bhadra & Pattanayak, 2017), therefore, it was adopted in this study. The results of (IVI) in the study area showed that the most dominant species was, P. floccosa, G. molle, and S. spinosum (L.) Spach. The prevalence of P. floccosa indicates that the study area was exposed to overgrazing because it was one of the plants that grazing animals avoid because of its hard hair (Dimopoulos et al., 2013). And G. molle, it was considered an invasive species and has a wide ability to spread (Aedo, 2000), and has a high ability to adapt to a wide range of soil types (Lee & Cavers, 1981). As for S. spinosum, was due to the spread of thorns on the entire plant, this led to the protection of plant parts, so grazing animals encounter difficulty in grazing on this plant, and it was considered a competition plant given that the plant covers a large area on the surface of the soil, it affects the presence of other species (Osem et al., 2007). When entering the value (IVI) for each quadrate in the CAP program, the vegetation in the study area was divided according to the Dendrogram and (DCA), into two communities, that according to elevation and the dominance of the species. Therefore, in community A

Table (4): Pearson-moment correlation (r) between the different soil variables in the sampled from both communities stands of the study area.

Soil analysis	Sand	Clay	Silt	Bulk density	M.C	PH	E.C	Total N	Available. P	OM	$CaCO_3$	Ca^{+2}	Mg^{+2}	Na^{+}	K^{+}	Cl^{-}	HCO_3^{-}
Sand																	
Clay	-1.000																
Silt	*	*															
Bulk density	-1.000	1.000	*														
M.C	-1.000	1.000	*	1.000													
PH	0.545	-0.545	*	-0.545	-0.545												
E.C	-0.993*	0.993*	*	0.993*	0.993*	-0.445											
Total N	-0.975*	0.975*	*	0.975*	0.975*	-0.687	0.946										
Available. P	-0.949	0.949	*	0.949	0.949	-0.431	0.951*	0.943									
OM	-0.997*	0.997*	*	0.997 *	0.997*	-0.576	0.985*	0.987*	0.961*								
$CaCO_3$	-0.999 *	0.999*	*	0.999*	0.999*	-0.529	0.994*	0.976*	0.964*	0.998*							
Ca^{+2}	-0.992 *	0.992*	*	0.992*	0.992*	-0.631	0.972	0.995*	0.951*	0.998*	0.992*						
Mg^{+2}	-0.943	0.943	*	0.943	0.943	-0.791	0.898	0.985*	0.872	0.956*	0.938	0.974*					
Na^{+}	-0.999*	0.999*	*	0.999*	0.999*	-0.518	0.996*	0.969*	0.954*	0.996*	0.999*	0.988*	0.932				
K^{+}	-0.999*	0.999*	*	0.999*	0.999*	-0.536	0.993*	0.977*	0.962*	0.999*	1.000	0.993*	0.940	0.999*			
Cl^{-}	-0.995*	0.995*	*	0.995*	0.995*	-0.619	0.978*	0.992*	0.946	0.998*	0.994*	0.999*	0.970*	0.992*	0.995*		
HCO_3^{-}	-0.905	0.905	*	0.905	0.905	-0.795	0.854	0.977*	0.889	0.930	0.907	0.952*	0.980*	0.894	0.910	0.941	
CO_3^{-}	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

* Correlation is significant at 0.05 level.

The pH value of the soil tends to be alkaline in both communities, due to the high percentage of calcium carbonate, (Lin et al., 2017). soil is characterized by low salinity in both communities, which is consistent with Ben Mahmoud (1995). The results of the available phosphorus analysis indicated that the soil in two communities was poor in available phosphorus, as the high soil content of calcium carbonate has a negative effect on the percentage of available phosphorus, (Lin et al., 2018; Randall & Grava, 1971).

The results also showed an increase in the percentage of organic matter in both communities, this rise is due to the clay texture of the soil and the high percentage of calcium carbonate, (Foth, 1985). The results of the analysis showed a decrease in the electrical conductivity in both communities, as well as a high pH in the soil, where it was found that there was an inverse relationship between the electrical conductivity value and the pH in the soil, (Aizat et al., 2014). And the large amount of rainfall can lead to the washing process of the elements and lead to the migration of the elements to the bottom (Ben Mahmoud, 1995), this explains the high concentration of elements at the second site in the study area. The results showed the absence of carbonates in the study area, and this is attributed to the alkaline pH that dissolves them (Chorom & Rengasamy, 1997). The elevation had negative results with the quality of the soil and these results are consistent with (Petersen, 2004), where the results of soil analysis showed that, low concentrations of nutrients in first site. When applying the correlation coefficient between soil variables. It was found that there was a positive relationship between most variables, and this was reflected in the quality of the soil in the study area, where the percentage of clay was higher than the percentage of sand, because clay had a positive relationship with most variables. While sand had a strong negative relationship with all variables except pH, it was found that there is a strong negative relationship between sand and clay, and this is consistent with (Bin Mahmoud, 1995).

CONCLUSION

In the study area, the major vegetation types, their composition and biodiversity were identified. The research is the first detailed vegetation survey to be completed in region and provides data which can be used as a baseline for monitoring change. 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.

This study will improve the understanding of the distribution and ecology of plant taxa in the region.

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