SJST

Adam, Dakeelm Ali & Lamlom / SILPHIUM Journal of Science and Technology. 7 (2), 2025, 1-16.

Research Article

SILPHIUM JOURNAL OF SCIENCE AND TECHNOLOGY

(SJST)

Vegetation analysis of Ibrak Nouta in Al-Jabal Al-Akhdar, Libya

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ABSTRACT

This study investigates the ecological characteristics and vegetation composition the Ibrak Nouta area, located in Soussa, Al-Jabal Al-Akhdar, Libya. Where the region had not been previously subjected to ecological studies. The study was conducted during the spring of 2023 using the quadrat method, with 20 quadrats (5×5 m^2) distributed along four transects. The aim was to identify the dominant plant species and evaluate soil characteristics that influence plant distribution. The study focused on mains ecological parameters such as frequency, density, and coverage, which were used to calculate the Importance Value Index (IVI) for each species. The data from 20 quadrat's IVI was entered into a community analysis package (CAP) program, for the Classification and ordination of Communities. Using a technique called TWINSPAN, which incorporates the Dendrogram and DCA, the vegetation in the study area was classified into four communities based on the species' predominance in each community and the similarity between the quadrates The highest IVI was recorded for Pistacia lentiscus (48.3), followed by Juniperus phoenicea ssp. turbinata (20.03), Paronychia arabica (12.7), and Ornithogalum divergens (6.3). These results indicate the prevalence of hardy, stress-tolerant species in the area. Soil samples were collected and analyzed for physical and chemical properties. The soils were found to be clay and slightly to moderately alkaline (pH 7.8–8.0), with moderate organic matter content and high calcium carbonate levels. These soil features are typical of the Al-Jabal Al-Akhdar region and play a significant role in supporting specific plant communities This research provides essential ecological data to guide future conservation efforts and supports the sustainable management of plant habitats in the region.

Keywords: *Vegetation composition, CAP, Importance value index, Ibrak Nouta, Al-Jabal Al-Akhdar.*

تحليل الغطاء النباتي لبرك نوطا في الجبل الأخضر ليبيا

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الملخص

تبحث هذه الدراسة في الخصائص البيئية وتركيب الغطاء النباتي في منطقة برك نوطا، الواقعة في سوسة، الجبل

الأخضر، ليبيا. حيث لم تخضع المنطقة سابقًا لدراسات بيئية. أُجريت الدراسة خلال ربيع عام 2023 باستخدام طريقة المربعات، حيث وزعت 20 تربيعًا (5×5 م2) على أربع قطاعات عرضية. وكان الهدف تحديد الأنواع النباتية السائدة وتقييم خصائص التربة التي تؤثر على توزيع النباتات. ركزت الدراسة على المعايير البيئية الرئيسية، مثل التكرار والكثافة والتغطية، والتي استُخدمت لحساب مؤشر قيمة (IVI)لكل نوع. أُدخلت بيانات مؤشر القيمة الهامة (IVI) للعشرين مربع في برنامج حزمة تحليل المجتمعات(CAP) ، لتصنيف المجتمعات وترتيبها. باستخدام تقنية تسمى TWINSPAN، والتي تدمج مخطط الشجيرات وتحليل التباين العميق، تم تصنيف الغطاء النباتي في منطقة الدراسة إلى أربع مجتمعات بناءً على غلبة الأنواع في كل مجتمع والتشابه بين المربعات. تم تسجيل أعلى مؤشر IVI لنبات *Pistacia lentiscus* (48.3)، يليه نبات *Juniperus phoenicea ssp. Turbinata* (20.03)، ونبات *Paronychia arabica* (12.7)، ولنبات *Ornithogalum divergens* (6.3) تشير هذه النتائج إلى انتشار الأنواع القوية المقاومة للإجهاد في المنطقة. تم جمع عينات التربة وتحليلها من حيث الخصائص الفيزيائية والكيميائية. وجد أن التربة طينية وقلوية قليلاً إلى معتدلة (درجة الحموضة 7.8-8.0)، مع محتوى معتدل من المادة العضوية ومستويات عالية من كربونات الكالسيوم. وتعتبر هذه السمات التربة نموذجية لمنطقة الجبل الأخضر وتلعب دورا هاما في دعم مجتمعات نباتية محددة. يوفر هذا البحث بيانات بيئية أساسية لتوجيه جهود الحفاظ المستقبلية ويدعم الإدارة المستدامة للموائل النباتية في المنطقة.

الكلمات المفتاحية: *تركيب الغطاء النباتي، مؤشر القيمة الهامة، برك نوطا، الجبل الأخضر*

INTRODUCTION

The plants grow in communities; each community is characterized by species diversity, growth forms, and structures, dominance successional trends. A certain analytical character such as frequency, densities, and the cover of species in a community is expressed in quantity to know their dominance. The quadrat method and line transect method serve the purpose of analytical characters (Mahajan and Fatima, 2017). The Quadrates Method most commonly utilized (Sorrells & Glenn, 1991) to estimate the population density of each species in a given community. Density is one of the most commonly sampled parameters (Askari et al., 2013), it plays a significant role as one of the important features in assessing rangelands characteristics of and changes in plant communities (Balouchi et al., 2017). Estimation of vegetation cover is the most widely used method of characterizing herbaceous and shrub vegetation (Gayton, 2013). A complete picture of the ecological importance of each species in the community was obtained by calculating the importance value index (IVI) the percentage values of relative frequency, relative density and relative cover were combined together (Curtis and McIntosh 1950).

The distribution of plant species and their presence in certain places is not random. Their presence is governed by several environmental factors, which may be natural, such as terrain, climate, and soil, or unnatural factors, such as human intervention. To understand the composition of the vegetation cover in any area, it must be analyzed statistically. When plant species are represented by one of the quantitative methods for studying vegetation cover, such as the quadrate's method, and then analyzed statistically using vegetation analysis programs, this provides a numerical description of the real world and thus helps the human brain to understand the composition of the vegetation cover easily. (Wildi, 2017).

Ibrak Nouta is another face of the beauty of nature in Libya and it's one of the Al-Jabal Al-Akhdar area that enjoys the characteristics of Mediterranean climate. The precipitation is concentrated in the winter, while the summer is dry and hot (Noah, 2014). Knowing the composition of plant communities and the dominant species in those areas are all factors that contribute to a better understanding of the quality of the vegetation cover composition. (Azone & Issa, 2016)

The study of vegetation cover in dry and semi-dry areas is necessary because they are very sensitive due to the great pressures they suffer from, such as high temperatures, low rainfall, and weak control, and thus they sometimes lose the ability to sustain themselves. (Al-Tellawi, 1989). So far, no prior research has been conducted on the plant diversity, composition, structure, threats, and regeneration state of the vegetation found in Ibrak Nouta, Soussa. Therefore, the purpose of this study is to close the current gap in knowledge and provide a Provide a descriptive analysis of the vegetation cover in the study area and confirm the results through soil analysis.

<u>MATERIALS AND METHODS</u>

1. The study area:

The study area is located in the Northeast of Libya about 20 km western coast of Soussa, between Latitude 32° 54. 555 ′ N, and Longitude 021° 48. 842′, E. Figure(1).

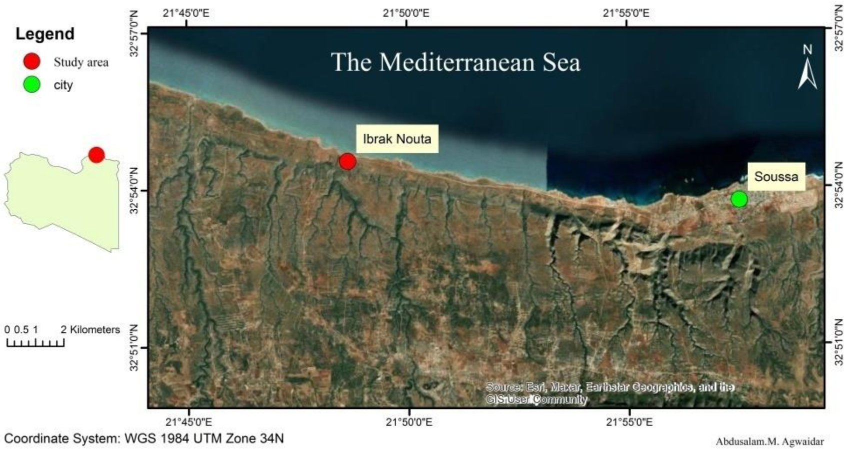

Figure 1: Illustrated the study area is located on the western coast of Soussa

2. Vegetation analysis:

The vegetation sampling was carried out during the spring season in the year 2023, using quadrates method along the study area and were distributed within 20 quadrates measuring (5m*5m). The relative values of each plant species' density, frequency, and coverage were determined and were represented by Importance value index (IVI) Table (1)

Table1: The importance value index (IVI) equations.

Equation	Reference
Frequency = Total number of quadrats in which the species occurred/ Total number of quadrats	Curtis and Mclntosh (1950) & Misra (1968);
Relative frequency = Frequency of species/ Frequency of all species*100	
Density = Total number of individuals of a species/ Area sampled	
Relative density = Density for a species/ Total density for all species *100	
Coverage = The area occupied by the species/ the whole investigated area	
Relative coverage = Coverage of species/ Coverage of all species*100	

IVI = Relative frequency + Relative density + Relative coverage

3. The Soil Analysis:

To find the physical and chemical characteristics of the soil, four soil samples at depth 30 cm were taken from the study location and brought to the lab. The soil samples were placed in polythene bags for analysis after being air dried, crushed, and sieved using a 2 mm sieve. The soil texture by the hydrometer method, as described in Black *et al*., (1965), The pH Meter was used to measure the pH of the soil (Peech, 1965) and Electrical conductivity is determined by (Corwin & Lesch, 2003) and the percentage of organic matter in the soil was determined by Jackson (1958), CaCo3 (Balazs *et al*., 2005), Using a device flame photometer it was measured sodium and potassium by (Richards,1954), the total nitrogen was determined using Nessler's method (Peech, 1947),) and A spectrophotometer was used to calculate the available phosphorus (Murphy method) (Murphy and Riley, 1962).

4. Statistical Analysis:

The vegetation data matrix was analyzed using Two-Way-Indicator Species Analysis (TWINSPAN), (Hill 1979). A Community Analysis Package (CAP) Program which includes the Dendrogram and Defriended Correspondence Analysis (DCA), (Henderson and Seaby, 1999). Microsoft Office Excel (Version 2019) was used to organize and present data statistically.

RESULTS

1. Ecological analysis

The table 2 was showed results of absolute and relative for density, frequency and coverage. The results of this field study showed that *Arisarum vulgare* O. Targ. Tozz had the highest density (13.14 plant / m^2) followed by *Paronychia arabica* (L) DC (8.83 plant / m^2), while the highest frequency (6.99%) for *Pistacia lentiscus* L., then *Arisarum vulgare* O. Targ. Tozz. by (4.94%); The results showed that the largest cover was recorded for *Pistacia lentiscus* L. (36.3), followed by *Juniperus phoenicea ssp. turbinata* (Guss.) Nyman (15.36). The highest importance value of the plant species was (48.3) for *Pistacia lentiscus* L., followed by *Euphorbia dendroides* L. (22.4).

The data from 20 quadrat's IVI was entered into a community analysis package (CAP) program, for the Classification and ordination of Communities. Using a technique called TWINSPAN, which incorporates the Dendrogram and DCA, the vegetation in the study area was classified where were distributed 71 species on four communities based on the species' predominance in each community and the similarity between the quadrates (Figure 2) and (Table 3). Illustrated dominant species in each community obtained by TWINSPAN classification in the study area. The highest importance value of the communities was (48.3) for *Pistacia lentiscus* L., followed by *Juniperus phoenicea ssp. turbinata* (Guss.) Nyman. (20.03*), Paronychia arabica* (L) Dc. (12.7), *Ornithogalum divergens* Boreau. (6.3).

Table 3: Listing of the most common species in each vegetation category, sorted alphabetically by TWINSPAN categorization in the study area.

Community A. **33 *Juniperus phoenicea ssp.turbinata***	Community B. **53 *Paronychia arabica* (L) Dc.**	Community C. **57 *Pistacia lentiscus* L.**	Community D. **52 *Ornithogalum divergens* Boreau.**

(Guss) Nyman.			
1 *Adonis dentata* Delile.	*Asparagus aphyllus* L.7	4 *Arisarum vulgare* O. Targ. Tozz.	*Allium roseum* L.2
***Arundo donax* L.6**	*Biscutalla didyma* L.11	5 *Arum cyrenaicum* Hruby.	3 *Anthemis pseudocotula* Boiss.
9 *Asphodelus ramosus* L.	37 *Lycium europaeum* L.	20 *Ceratonia siliqua* L.	10 *Bellevalia sessiliflora* (Viv) Kunth.
***Asparagus horridus* L.8**	45 *Micromeria nervosa* (Desf) Benth	23 *Centaurea alexandrina* Delile.	12 *Bromus madritensis* L.
17 *Calicotome spinosa* (L) Link.	47 *Nicotiana glauca* R.C. Graham.	29 *Euphorbia dendroides* L.	14 *Bromus rubens* L.
18 *Campanula erinus* L.	50 *Onopordum arenarium* (Desf) Pomel.	44 *Mercurialis annua* L.	13 *Bromus rigidus* Roth.
21 *Carduus argentatus* L.	58 *Pseudodictamnus mediterraneus* Salmaki & Siadati	48 *Notobasis syriaca* (L) Cass.	*Calendula arvensis* L.15
25 *Cuscuta epithymum* (L) L.	-	56 *Phlomis floccosa* D. Don.	*16 Calendula tripterocarpa* Rupr.
26 *Drimia pancration* (Steinh.) J.C. Manning & Goldblatt.	-	66 *Sherardia arvensis* L.	19 *Capsella bursa-pastoris* (L) Medik.
27 *Erodium malacoides* (L) L'Her.	-	-	22 *Carduus getulus* Pomel.
***Juncus acutus* L.32**	-	-	24 *Cichorium spinosum* L.
34 *Lamarckia aurea* (L) Moench.	-	-	28 *Erodium moschatum* (L) L'Her.
35 *Linum nodiflorum* L.	-	-	30 *Euphorbia peplus* L.
***41 Marrubium vulgare* L.**	-	-	31 *Hordeum marianum* Huds.
***55 Periploca angustifolia* Labill.**	-	-	36 *Lotus corniculatus* L.
***59 Reichardia tingitana* (L) Roth.**	-	-	38 *Lysimachia arvensis* (L) U. Manns & Anderb.
***61 Rostraria* cristara (L) Tzvelev**	-	-	39*Malva aegyptia* L.
***62 Sarcopoterium spinosum* (L) Spach.**	-	-	*40 Malva sylvestris* L.
***63 Scandix pectin-veneris* L.**	-	-	*42 Medicago littoralis* Rohde ex Loisel.
-	-	-	*43 Medicago polymorpha* L.
-	-	-	*46 Nerium oleander* L.
-	-	-	*49 Oleae uropaea ssp. cuspidate* (Wall. & G. Don) Cif.
-	-	-	*51 Onopordum cyrenaicum* Maire & Weiller.

-	-	-	*54 Paronychia argentea* Lam.
-	-	-	*60 Rhamnus oleoides* L.
-	-	-	*64 Scorpiurns muricatus* L.
-	-	-	*65 Searsia tripartite* (Ucria.) Moffett.
-	-	-	*67 Stipellula capensis* (Thunb.) Roser & Hamasha
-	-	-	*68 Tamarix africana* Poir.
-	-	-	*69 Teucrium apollinis* Maire Schreber.
-	-	-	70 *Urtica pilulifera* L.
-	-	-	*71 Valeriana graciliflora* (Fisch. & C. A. Mey.) Byng & Christenh

Figure 2: The dendrogram of the 20 quadrates stands, produced by Two Way Indicator Species Analysis (TWINSPAN), is based on the importance values of the 71 dominant species, orderd alphabetically.

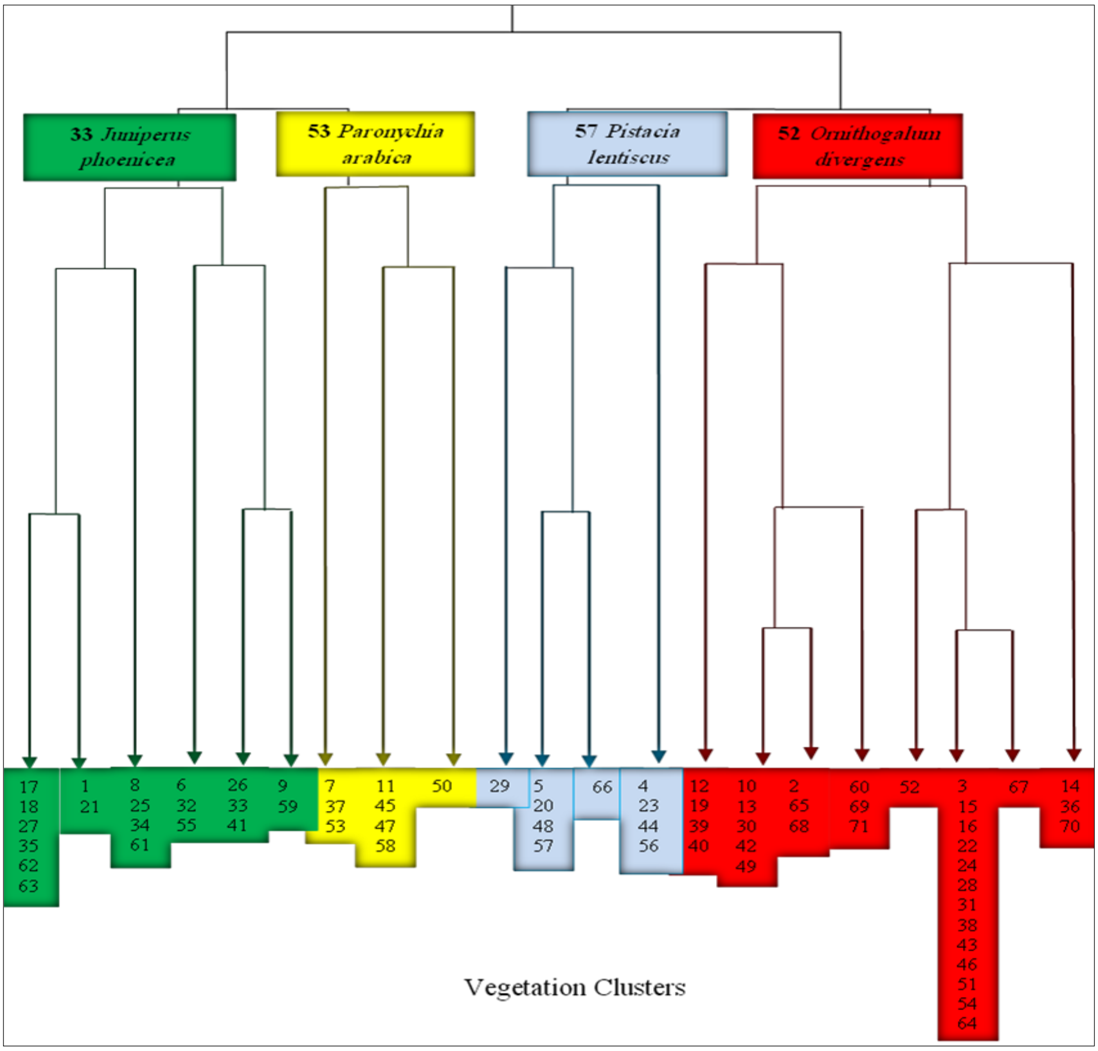

Table 2: The study area's dominating species in each community group are identified by their relative density, relative frequency, relative cover, and impedance values index.

	Scientific name	Density	R.D	Frequency	R.F	Coverage	R.C	IVI
1	*Adonis dentata* Delile.	0.034	0.431369	0.2	1.205141	0.000029	0.020927	1.65743665
2	*Allium roseum* L.	0.002	0.02924	0.05	0.2	0.0000128	0.002269	0.23150907
3	*Anthemis pseudocotula* Boiss.	0.028	0.325581	0.05	0.333333	0.0000192	0.008635	0.66754896
4	*Arisarum vulgare* O. Targ. Tozz.	0.762	13.13769	0.7	4.937754	0.0000404	0.019194	18.0946375
5	*Arum cyrenaicum* Hruby.	0.216	3.173304	0.55	3.830828	0.0002756	0.091202	7.09533368
6	*Arundo donax* L.	0.178	2.959486	0.2	1.511688	0.0004284	0.1223	4.59347352
7	*Asparagus aphyllus* L.	0.006	0.08973	0.1	0.557143	0.0002574	0.049808	0.6966813
8	*Asparagus horridus* L.	0.034	0.53096	0.1	0.654545	0.0009494	0.442109	1.62761435
9	*Asphodelus ramosus* L.	0.484	6.298893	0.4	2.556802	0.0018082	0.690987	9.54668154
10	*Bellevalia sessiliflora* (Viv) Kunth.	0.09	1.430299	0.25	1.604762	0.00003956	0.011903	3.04696427
11	*Biscutalla didyma* L.	0.024	0.292817	0.1	0.533333	0.0000836	0.045439	0.87158949
12	*Bromus madritensis* L.	0.11	1.923318	0.2	1.192063	0.0000562	0.020527	3.13590799
13	*Bromus rigidus* Roth.	0.044	0.555556	0.05	0.357143	0.0000122	0.004684	0.91738273
14	*Bromus rubens* L.	0.106	1.845085	0.15	1.049784	0.0000358	0.02498	2.91984933
15	*Calendula arvensis* L.	0.028	0.466673	0.15	0.923611	0.0000164	0.006622	1.39690642
16	*Calendula tripterocarpa* Rupr.	0.002	0.023256	0.05	0.333333	0.0000128	0.005757	0.36234564
17	*Calicotome spinosa* (L) Link.	0.014	0.185354	0.1	0.697115	0.0110868	3.913441	4.79591003
18	*Campanula erinus* L.	0.006	0.073892	0.05	0.2	0.0000188	0.011578	0.28547035

19	*Capsella bursa-pastoris* (L) Medik.	0.09	1.329202	0.2	1.22381	0.0001049	0.055379	2.60839096
20	*Caratonia siliqua* L.	0.034	0.548776	0.25	1.646609	0.0158866	3.137045	5.3324298
21	*Carduus argentatus* L.	0.046	0.648709	0.15	0.892641	0.0001326	0.121424	1.66277429
22	*Carduus getulus* Pomel.	0.004	0.064103	0.05	0.277778	0.0000196	0.012078	0.35395859
23	*Centaurea alexandrina* Delile.	0.062	0.853593	0.25	1.406349	0.0002921	0.162527	2.42246939
24	*Cichorium spinosum* L.	0.022	0.352564	0.05	0.277778	0.0006602	0.406818	1.03715968
25	*Cuscuta epithymum* (L) L.	0.018	0.331845	0.1	0.714286	0.0000322	0.012899	1.05902958
26	*Drimia pancration* (Steinh.) J.C. Manning & Goldblatt.	0.51	7.581627	0.65	4.558966	0.001685	0.967762	13.1083549
27	*Erodium malacoides* (L) L'Her.	0.042	0.531833	0.15	0.822711	0.0000948	0.041057	1.39560089
28	*Erodium moschatum* (L) L'Her.	0.006	0.069767	0.05	0.333333	0.0000208	0.009355	0.41245454
29	*Euphorbia dendroides* L.	0.218	3.788453	0.55	4.228139	0.03438102	14.40715	22.4237438
30	*Euphorbia peplus* L.	0.04	0.539607	0.15	0.890476	0.00002992	0.009727	1.43980964
31	*Hordeum marianum* Huds.	0.012	0.192308	0.05	0.277778	0.0000188	0.011585	0.48167063
32	*Juncus acutus* L.	0.07	1.219346	0.15	1.011688	0.0024294	0.766623	2.9976568
33	*Juniperus phoenicea ssp.turbinata* (Guss.) Nyman	0.076	1.140442	0.5	3.532992	0.0639262	15.36147	20.0349088
34	*Lamarckia aurea*(L) Moench.	0.158	2.381747	0.3	2.062284	0.0001058	0.06488	4.50891142
35	*Linum nodiflorum* L.	0.026	0.326355	0.1	0.5125	0.0000816	0.038673	0.87752793
36	*Lotus corniculatus* L.	0.07	0.802624	0.1	0.571429	0.0000244	0.011374	1.38542664
37	*Lycium europaeum* L.	0.118	1.776156	0.4	2.871807	0.02122896	7.545637	12.1935999
38	*Lysimachia arvensis* (L) U.Manns & Anderb.	0.014	0.209878	0.15	1.100379	0.0000236	0.01394	1.32419749
39	*Malva aegyptia* L.	0.068	0.917807	0.35	1.998214	0.00003164	0.01165	2.92767062

40	*Malva sylvestris* L.	0.01	0.143524	0.2	1.152381	0.0000816	0.02225	1.31815515
41	*Marrubium vulgare* L.	0.186	3.452652	0.3	2.650849	0.0013	0.852072	6.95557267
42	*Medicago littoralis* Rohde ex Loisel.	0.002	0.032895	0.05	0.333333	0.00000176	0.003647	0.36987518
43	*Medicago polymorpha* L.	0.006	0.093342	0.1	0.477778	0.0000232	0.00938	0.58049988
44	*Mercurialis annua* L.	0.04	0.555707	0.25	1.553571	0.00007438	0.035291	2.14456924
45	*Micromeria nervosa* (Desf) Benth	0.008	0.127356	0.1	0.669643	0.000108	0.035894	0.83289264
46	*Nerium oleander* L.	0.002	0.032051	0.05	0.277778	0.0016522	1.018092	1.32792074
47	*Nicotiana glauca* R.C. Graham.	0.028	0.459071	0.1	0.7	0.0037042	2.637879	3.79695036
48	*Notobasis syriaca* (L) Cass.	0.1	1.518577	0.5	3.325056	0.0002076	0.09828	4.94191331
49	*Olea europaea ssp. cuspidate* (Wall. & G.Don) Cif.	0.008	0.185185	0.05	0.357143	0.007881	0.546039	1.08836681
50	*Onopordum arenarium* (Desf) Pomel.	0.092	1.417278	0.25	1.622799	0.0008358	0.340349	3.38042577
51	*Onopordum cyrenaicum* Maire & Weiller.	0.008	0.128205	0.05	0.277778	0.000312	0.192256	0.59823855
52	*Ornithogalum divergens* Boreau.	0.192	3.130808	0.45	3.125776	0.0000964	0.059531	6.31611546
53	*Paronychia arabica* (L) Dc.	0.568	8.832495	0.5	3.700056	0.0003134	0.140197	12.672748
54	*Paronychia argentea* Lam.	0.072	1.371045	0.15	1.232323	0.0000732	0.067119	2.67048745
55	*Periploca angustifolia* Labill.	0.042	0.640025	0.35	2.805395	0.0082682	2.508074	5.95349444
56	*Phlomis floccosa* D. Don.	0.142	2.129647	0.55	3.382143	0.00337476	1.190134	6.70192438
57	*Pistacia lentiscus* L.	0.32	4.987776	0.95	6.996051	0.12476928	36.30231	48.286138
58	*Pseudodictamnus mediterraneus* Salmaki & Siadati	0.076	1.241666	0.1	0.811688	0.0021576	0.65626	2.70961385
59	*Reichardia tingitana* (L) Roth.	0.142	1.856685	0.25	1.865135	0.0000964	0.055794	3.77761419
60	*Rhamnus oleoides* L.	0.006	0.114504	0.05	0.357143	0.0023868	0.776205	1.24785222

61	*Rostraria* cristara (L) Tzvelev	0.192	2.829812	0.3	2.016829	0.0000844	0.045447	4.89208809
62	*Sarcopoterium spinosum* (L) Spach.	0.016	0.197044	0.05	0.2	0.00056	0.344887	0.74193105
63	*Scandix pectin-veneris* L.	0.014	0.162625	0.1	0.438095	0.0000612	0.034452	0.6351725
64	*Scorpiurns muricatus* L.	0.004	0.064103	0.05	0.277778	0.0000078	0.004806	0.34668739
65	*Searsia tripartite* (Ucria.) Moffett.	0.004	0.066834	0.1	0.5125	0.0202284	2.469166	3.04850004
66	*Sherardia arvensis* L.	0.086	1.195947	0.3	1.641071	0.00003994	0.019563	2.85658077
67	*Stipellula capensis* (Thunb.) Roser & Hamasha	0.12	1.682112	0.1	0.645833	0.000039	0.010993	2.33893841
68	*Tamarix africana* Poir.	0.008	0.116959	0.05	0.2	0.001629	0.288774	0.60573349
69	*Teucrium apollinis* Maire Schreber.	0.002	0.038168	0.05	0.357143	0.0000168	0.005463	0.40077449
70	Urtica pilulifera L.	0.088	1.61892	0.2	1.289466	0.0007652	0.501889	3.41027527
71	*Valeriana graciliflora* (Fisch. & C. A. Mey.) Byng & Christenh.	0.008	0.197742	0.1	0.857143	0.0001202	0.066083	1.1209681
Total			100		100		100	300

Analysis (DCA) ordination confirms on the segregation of four vegetation communities and that was on the data of 71 species Figure (3).

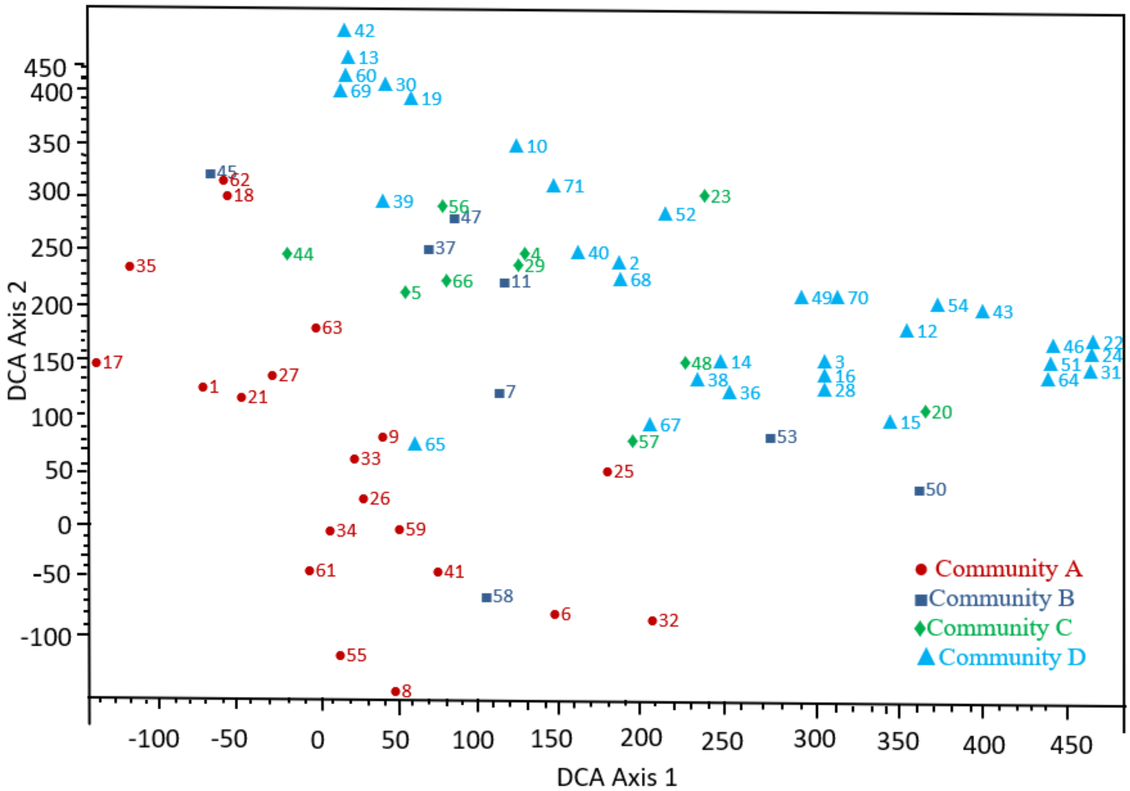

Figure 3: The ordination diagram of stands using the Defriended Correspondence Analysis (DCA) method displays vegetation communities based on the TWINSPAN categorization system, which assigns importance values to 71 species.

Table 4: Four community groups in the research area's physical and chemical qualities of the soil in the spring.

Soil analysis	*Juniperus phoenicea ssp.turbinata* (Guss) Nyman	*Paronychia arabica* (L) Dc.	*Pistacia lentiscus* L.	*Ornithogalum divergens* Boreau.
Sand (%)	22	21	19	21
Clay (%)	68	66	67	65
Silt (%)	10	13	14	14
Texture type		Clay		
pH	7.9	7.8	8	7.8
EC µS/cm	312	324	310	307
O.M (%)	3.2	3.65	3.18	2.67
$CaCO_3$ (%)	27.14	28.32	26.25	28.17
Total N mg/kg	4.55	5	4.47	3.89
Total P mg/kg	3.14	3.33	2.77	2.75
K^+mg/kg	37.87	38.4	36.45	35.67

Na^+ mg/kg	58.79	60.34	61.6	60

According to the results shown in Table (4), the mechanical analysis shows that the soil falls within the clay texture range, with the texture classification indicating a predominance of clay ranging between 65% to 68%. The pH values range between 7.8 and 8.0, indicating soil that is alkaline to moderately alkaline. The electrical conductivity values ranged between 307 and 324 µS/cm, with an average of 313 µS/cm. The organic matter content ranged from 2.67% to 3.65%, indicating moderate levels of organic matter. The CaCO3 content, as indicated in Table (3), is relatively high across all communities (26.25-28.32%). The total Nitrogen and Phosphorus levels 3.89-5 mg/kg and 2.77-3.33 mg/kg respectively. Sodium and Potassium levels ranged between 58.79 and 61.6 mg/kg and 35.67-38.4 mg/kg respectively.

DISSCUSION

The (IVI), was what scientists consider 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, 1950; Bhadra & Pattanayak, 2017). The results of field study showed that, 20 quadrates distributed over four Transects.71 species were measured. The highest importance value of the plant species. (48.3) for *Pistacia lentiscus* L., followed by *Juniperus phoenicea ssp. turbinata* (Guss.) Nyman. (20.03), *Paronychia arabica* (L) Dc. (12.7), *Ornithogalum divergens* Boreau. (6.3). We note that *Pistacia* and *Juniperus* trees are prevalent, and this means that the area is far from urban activity and animals, because the terrain of the area is difficult, Where the study area is located on the first terrace in the parts close to the first mountain edge, this edge is distinguished by its plants of Pistacia lentiscus and Juniperus phoenicea, as well as resulting from the deterioration of the forests of Al-Jabal Al-Akhdar, the appearance of plant clusters consisting of short trees whose height does not exceed 1 metre known as Maquis, it is spread in different regions in terms of the amount of rain it receives. It is found in the coastal region and the northern foothills. *Pistacia lentiscus* and *Juniperus phoenicea* are considered one of the most widespread types of maquis. *Juniperus* is affected by erosion or is sensitive to any environmental change. Its sovereignty means that the area is considered good, not exposed to erosion or fires, and in general, not exposed to deterioration (Noah, 2014).

Paronychia arabica (L) Dc and *Ornithogalum divergens* Boreau It is considered one of the plants that tolerate drought, high temperatures, and the dry months that characterize the Mediterranean climate, which are the summer months, these species are considered to be carriers of Mediterranean life forms. The first is a therophyte, which is able to complete its life cycle in one season, and the second is a geophyte, whose buds are found under the surface of the earth, and thus you find them controlling harsh environments due to their high adaptability. (Archibold, 1995; Shaltout *et al*., 2010 &Baker 1974).

The soil analyses show similarity in the four communities, as we notice the clay texture of the soil, which is due to the type of soil formed by the climate that characterizes the Jabal Al Akhdar region (Hafiz, 2007). We also notice a large increase in the percentage of calcium carbonate, which is natural due to the composition of the mother stone of the Jabal Al Akhdar region (Omar Al-Mukhtar University, 2005). We also notice that the pH is alkaline, and this is due to the high percentage of calcium carbonate in four communities (Zhao, 2007). Also, the alkaline soil has an effect on electrical conductivity, as the presence of high concentrations of ions, especially basic ions such as calcium, increases electrical conductivity. The more basic the soil is, the higher the levels of dissolved salts it contains, which in turn increases electrical conductivity. (Al-Busaidi & Cookson, 2003). The Organic materials are essential for improving soil structure, water retention, and nutrient supplies. We also notice an increase in organic matter because the clay texture of the soil led to a high level of organic matter, which is consistent with (Habel *et al*., 2019)., and its increase supports the activity of many decomposing organisms in the soil, as it contributed to the increase in total nitrogen, as organic matter is considered an important source of nitrogen in the soil, as the decomposition of organic matter releases nitrogen in its various forms (Von Gadow, 2006). The phosphorus percentages indicate relatively low levels of this element (Black *et al*., 1965). This is due to the high soil content of calcium carbonate, which has a negative impact on the phosphorus ratio (Randall and Grava, 1971).

CONCLUSION

The findings of this study reveal that the Ibrak Nouta area in Soussa, Al-Jabal Al-Akhdar, hosts a distinctive plant diversity influenced by local soil characteristics and surrounding environmental conditions. Dominant species such as *Pistacia lentiscus* and *Juniperus phoenicea ssp. turbinata* reflect the resilience of vegetation to harsh environmental factors. Soil analysis indicated that features like alkalinity and high calcium carbonate content play a key role in shaping plant community distribution. This study highlights the importance of continued ecological research to support biodiversity conservation efforts and guide the sustainable management of plant resources in the region.

ACKNOWLEDGEMENT

We would like to thank Ms. Enas, M. Saed Lecturer assist in The Department of Botany- Faculty of Science- Omer Al-Mukhtar University for her support and valuable contributions to this research.

CONFLICT OF INTEREST

We pronounce that we have no strife of intrigued.

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