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EXAMPLE OF RECENT DEVELOPMENT OF PLANT COVERAGE IN TLEMCEN REGION (ALGERIA)

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ABSTRACT

The objective of this study is to try to understand the evolution of the vegetation in the littoral and the steppe of the region of Tlemcen. The data used are floristic inventories from 2000 and 2019 in the stations of Ghazaouet and Sidi Djilali combined with climatic data from the two periods. This made it possible to detect the changes over a period of 20 years. Despite the multiple anthropozoogenic actions that our region undergoes, the results show stability in the steppe region and a some progression of the plant cover in the Ghazaouet station. These results are preliminary and require verification at other stations.

Keywords **:** Tlemcen–Littoral –steppe –diversity– dynamic.

Introduction

Environmental problems were accentuated with the economic and demographic growth that the world experienced in the second half of the 20th century. The regression of natural spaces was at the origin of global movements that led to the implementation of international conventions for the protection of natural resources. Despite all these provisions, natural resources are degrading dangerously. Nowadays, protected areas are one of the most effective means of preserving nature, despite the strong pressures they experience (Noël Gansaonré *et al*., 2020).

The presence of different plant strata (herbaceous, tree-lined, etc.) constitute biodiversity in a region, this word has recently been introduced in the dictionary of ecology and can be considered as a neologism composed from the words biology and diversity.

Biodiversity is the product, for many, of a traditional and harmonious use of an environment by man (Quézel, 2000).

In the assessment established by Quézel *et al*. (1999), the Mediterranean forest is made up of around 247 woody species compared to European forests (13 species).

In North-West Mediterranean Africa, a first assessment was attempted in 1978 by Quézel and showed the presence outside the Saharan portions of the three countries, of 916 genera, 4034 species including 1038 endemic(Quézel, 2000).

The studies established on the vegetation of the Algerian forest show that its plant heritage is very rich and diversified. (Benabadji, 1995; Bouazza *et al*., 2001).

According to Bouazza *et al*. (2004), the pre-forest and steppe areas are the scene of a harmful and continuous ecological imbalance resulting from the very high load they are subjected to, on the one hand, and their low production on the other.

The Tlemcen region is no exception to circum-Mediterranean natural laws. Numerous research programs, through international publications, have underlined the major role of various regions of this area as an essential reservoir of plant biodiversity (Bouazza and Benabadji, 2010). These authors add that Tlemcen is one of the regions richest in plant biodiversity combined with high endemism. But this region has suffered a very significant and relatively recent anthropogenic impact.

The notion of dynamics found its culmination with the work of Gaussen (1954) on the Pyrenees, then those of Ozenda (1954).It has since been taken up by many authors (Bonin *et al*., 1983).

Biodiversity and vegetation dynamics have continued to attract the attention of several researchers in recent years, for example the work of : Bommel (2000), Quézel (2000), Bestaoui (2001), Barbero (2003), Bouazza *et al*. (2004), Hessas (2005), Barka (2009), Benabadji *et al*. (2009), Haddouche (2009), Stambouli-Meziane *et al*. (2009), Bangirinama *et al*. (2010), Aboura (2011), Bouiadjra *et al*. (2011), Quense (2011), Regagba (2012), Torahi (2012), Acherkouk *et al*. (2012), Babali (2014), Zennouche (2015), Beldjilali (2016), Chermat *et al*. (2016), Nebia (2016), Boudjema (2017), Ghezlaoui *et al*. (2017), Kerrache (2019), Sylla *et al*. (2019), Bahi *et al*. (2020), Chekchaki *et al*. (2020), Oukil *et al*. (2020), Merega *et al*. (2021), Benmechta *et al*. (2021).

In order to carry out our work and follow the dynamics of plant biodiversity in the meadows, we opted for a diachronic study between 2000 and 2019 in the Tlemcen region. For this we have chosen two stations, the first is the station of Ghazaouet on the coast north of the Traras mountains, the second is the station of Sidi Djilali south of Tlemcen in the high steppe plains.

Materials and Methods

- **Geographical situation**

The Tlemcen region is located on the western part of Northwest Algeria near the Algerian-Moroccan border. It is bounded to the north by the Mediterranean Sea and has a seafront of 120 km. Covering an area of 9,017.69 km², the capital of the state is located 432 km west of the capital Algiers.

The study region is located between 34° 25" and 35°25" N latitude and 1°55" and 2°30" W longitude, with an average elevation of 850 m. It is geographically limited to the north by the Mediterranean Sea, to the north-east by the state of Ain Temouchent, to the east by the state of Sidi Bel-Abbès, to the west by the Algerian-Moroccan border and to the south by the state of Naâma.

Naturally it contains various ecosystems ranging from the coast to the steppe. This diversity includes : the mountains of Trarass, the mountains of Tlemcen, the mountains of Sebaa chioukh, the full and interior plateaus, the full of Maghnia and the steppe zone.

We took two stations distributed between the coast and the steppe of the Tlemcen region and are respectively the stations of Ghazaouet (littoral) and Sidi Djilali (steppe) (Fig.1).

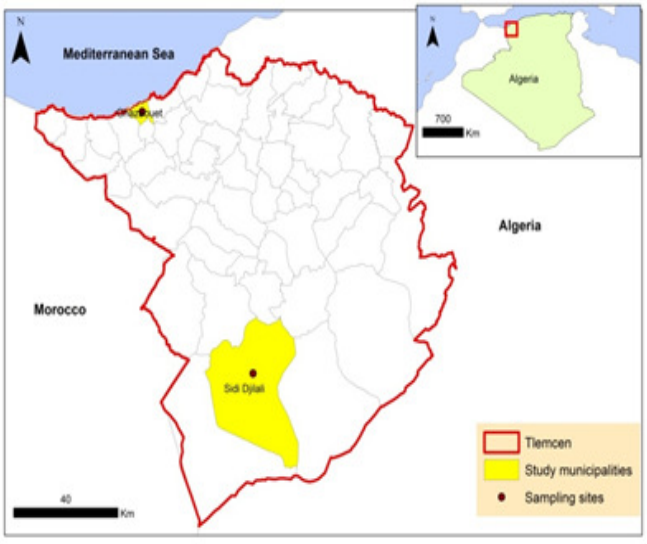

Fig.1 : Location of study stations

- **Bioclimatology**

The meteorological data we used concern the two stations chosen in the Tlemcen region, the first is on the coast (north of the region), the second is on the steppe (south of the region) and correspond to the stations which appear in Table 1 with two periods (old 1985-1999 and new 2004-2018).

Table 1 : Geographic data from meteorological stations

Stations	North Latitude	West longitude	Altitude (m)	State
Ghazaouet	35° 06'	01° 52'	04	**Tlemcen**
Sidii Djilali	34°27'	01°34'	1280	**Tlemcen**

For the climatic data (1985-1999) of the two meteorological stations, rainfall is significant in the order of 349.60 mm / year in Ghazaouet and 385.13 mm / year in Sidi Djilali. After this period some increase is noticed during the period (2004/2018) where a value of 387.60 mm / year is noted for the Ghazaouet station and 435.27 mm / year for the Sidi Djilali station (Table 2).

In 2010, Bouazza and Benabadji reported that in general, the western region of Algeria is characterized by low rainfall with great inter-monthly and inter-annual variability.

Through the analysis of temperature data (old and new period), we see that the thermal maxima (M) are 32.07 °C in Ghazaouet and 33.1 °C in Sidi Djilali for the period (1985-1999), they amount to 32.48 °C in Ghazaouet and 34.09 °C in Sidi Djilali for the new period (2004-2018) (Table 2).

On the other hand, the minimum temperatures in the region (m) are 6.21 °C in Ghazaouet and 0.51 °C in Sidi Djilali for the old period 1985-1999. They show values of 5.8 °C in Ghazaouet and 0 °C in Sidi Djilali for the new period which runs from 2004 to 2018.

For all of our stations, the maximum temperature values increase for the new period, while the minimum temperatures decrease in the new period and for both stations.

As a result, the thermal amplitudes of the two stations increased between the two periods, they are 25.86 ° C and 32.59 °C for the period (1985-1999) and between 26.68 °C and 34.09 °C for the period (2004- 2018).

The distinction of several bioclimatic stages is the result of the different Q2 obtained for the two stations during the two periods, the Ghazaouet station jostled from the lower semi-arid bioclimatic stage to mild temperate winter to the semi-arid stage above Mild temperate winter (Q2 goes from 46.28 to 49.73) (Table 2).

For the Sidi Djilali station, we also note a change of floor, it went from semi-arid lower with cool winter to semi-arid upper with cool winter following the increase in Q2 from 40.78 to 44.02.

The Bagnouls and Gaussen ombrothermal diagrams of the two stations in the two periods show two distinct seasons of which one is wet and the second is dry. The Sidi Djilali station has stability in the dry season with five and a half months of drought for both periods. In addition, a slight decrease of half a month is marked for the Ghazaouet station in the length of the dry season, which goes from seven to six and a half months.

Table 2 : Climatic data and bioclimatic stages

	P (mm)		M (°C)		M (°C)		(M-m) °C		Q2		Bioclimatic floors	
Stations	**OP**	**NP**	**OP**	**NP**	**OP**	**NP**	**OP**	**NP**	**OP**	**NP**	**OP**	**NP**
Ghazaouet	349,60	387,60	32,07	32,48	6,21	5,8	25,86	26,68	46,28	49,73	Semi-arid lower to mild temperate winter	Semi-arid superior to mild temperate winter
Sidi Djilali	385,13	435,27	33,1	34,09	0,51	0	32,59	34,09	40,78	44,02	Semi-arid lower to cool winter	Semi-arid superior to cool winter

- **Methodology**

The knowledge of the floristic composition of the study region passes mainly through botanical inventories carried out in the field followed by an identification of each plant species from the New flora of Algeria and southern desert regions. (Quézel and Santa, 1962).

The vegetation study was carried out by the method of Braun Blanquet (1951). For this, sites of each station, considered representative and heterogeneous from the point of view of micro-station conditions (slope, opening of the medium) were chosen.

The ecological zoning was carried out by choosing, Ghazaouet in the coast of the Traras mountains in the North and Sidi Djilali in the steppe in the south of Tlemcen.

These two zones are different from each other by the geographical position, the climate, the topography, the edaphic conditions and the anthropogenic factors.

The floristic surveys carried out in the two stations allow us to develop tables which give an idea of the floristic richness in the two periods (see appendices).

Results

State of vegetation in 2000

The first important assessment is the difference in the number of species between the station located on the coast (Ghazaouet) with 55 species and that of the steppe (Sidi Djilali) with 111 species. This reveals the rich flora of the southern resort of the Tlemcen region.

On the surveys carried out, we note morphologically, a dominance of woody plants (52.73%) for the Ghazaouet station and annual herbaceous plants (58.56%) for the Sidi Djilali station. The latter increase the floristic richness in this station (Table 3).

Table 3 : Percentage of morphological types

	Ghazaouet				Sidi Djilali			
	2000		2019		2000		2019	
	Nmbr of sp	%	Nmbr of sp	%	Nmbr of sp	%	Nmbr of sp	%
Annual herbaceous	20	36,36	19	23,46	65	58,56	54	49,09
Perennial herbaceous	06	10,91	20	24,69	37	33,33	38	34,55
Perennial woody	29	52,73	42	51,85	09	8,11	18	16,36

For the biological types we observed an equality between the therophyte and the chamaéphyte (32.73%) in the littoral region and a dominance of the therophyte (41.44%) followed by the chamaéphyte (25.23%) in the steppe region (Table 4).

Table 4: Percentage of biological types

	Ghazaouet				Sidi Djilali			
	2000		2019		2000		2019	
	Nmbr of sp	%	Nmbr of sp	%	Nmbr of sp	%	Nmbr of sp	%
Therophytes	18	32,73	19	23,46	46	41,44	42	38,18
Chamephytes	18	32,73	35	43,21	28	25,23	34	30,91
Hemicryptophytes	04	7,27	10	12,35	23	20,72	13	11,82
Geophytes	02	3,64	09	11,11	11	9,91	10	9,09
Phanerophytes	13	23,64	08	9,88	03	2,70	11	10,00

Regarding the dominance of families, asteraceae are at the top of the list for the two stations with a number of 07 species (12.73%) for the Ghazaouet station and 24 species (21.62%) for the Sidi Djilali station (Table 5 and 6).
This classification is followed by the dominance of poaceae (12.61%), lamiaceae (9.01%), fabaceae (8.11%) and apiaceae (5.41) for the steppe zone. Regarding the littoral zone, a percentage of 9.09% was noted for fabaceae, lamiaceae and poaceae and 5.45% for oleaceae.

Table 5: Percentage of Families in Ghazaouet station

	Ghazaouet 2000		Ghazaouet 2019	
Families	**Nmbr of sp**	**%**	**Nmbr of sp**	**%**
Anacardiaceae	2	3,64	01	1,23
Apiaceae	/	/	02	2,47
Apocynaceae	1	1,82	/	/
Aristolochiaceae	1	1,82	/	/
Astéraceae	7	12,73	10	12,35
Boraginaceae	1	1,82	03	3,70
Brassicaceae	1	1,82	02	2,47
Caryophyllaceae	1	1,82	01	1,23
Césalpinaceae	1	1,82	01	1,23
Cistaceae	2	3,64	07	8,64
Convolvulaceae	1	1,82	/	/
Crassulaceae	1	1,82	/	/
Cupressaceae	2	3,64	02	2,47
Éricaceae	2	3,64	01	1,23
Euphorbiaceae	1	1,82	01	1,23
Fabaceae	5	9,09	07	8,64
Fagaceae	2	3,64	01	1,23
Géraniaceae	1	1,82	/	/
Globulariaceae	1	1,82	01	1,23
Iridaceae	/	/	01	1,23
Lamiaceae	5	9,09	01	1,23
Liliaceae	1	1,82	02	2,47
Myrtaceae	1	1,82	/	/
Oléaceae	3	5,45	01	1,23
Orchidaceae	/	/	04	4,94
Palmaceae	1	1,82	01	1,23
Pinaceae	1	1,82	01	1,23
Plantaginaceae	1	1,82	02	2,47
Poaceae	5	9,09	07	8,64
Primulaceae	1	1,82	03	3,70
Résédaceae	/	/	01	1,23
Rhamnaceae	1	1,82	01	1,23
Rubiaceae	/	/	03	3,70
Rutaceae	/	/	01	1,23
Santalaceae	/	/	01	1,23
Scrophulariaceae	1	1,82	/	/
Thymelaeaceae	1	1,82	02	2,47
Violaceae	/	/	01	1,23
Zygophyllaceae	/	/	01	1,23

Table 6: Percentage of Families in the Sidi Djilali resort

	Sidi Djilali 2000		Sidi Djilali 2019	
Families	**Nmbr of sp**	**%**	**Nmbr of sp**	**%**
Anacardiaceae	/	/	01	0,91
Apiaceae	06	5,41	03	2,73
Araceae	/	/	01	0,91
Astéraceae	24	21,62	20	18,18
Boraginaceae	02	1,80	01	0,91
Brassicaceae	03	2,70	06	5,45
Caprifoliaceae	/	/	01	0,91
Caryophyllaceae	05	4,50	02	1,82
Cistaceae	03	2,70	07	6,36
Convolvulaceae	01	0,90	01	0,91
Crassulaceae	02	1,80	/	/
Cupressaceae	01	0,90	01	0,91
Dipsacaceae	01	0,90	03	2,73

Ericaceae	/	/	02	1,82
Euphorbiaceae	02	1,80	01	0,91
Fabaceae	09	8,11	07	6,36
Fagaceae	01	0,90	01	0,91
Géraniaceae	02	1,80	01	0,91
Iridaceae	/	/	03	2,73
Lamiaceae	10	9,01	11	10,00
Liliaceae	05	4,50	06	5,45
Linaceae	/	/	02	1,82
Malvaceae	02	1,80	01	0,91
Oleaceae	/	/	03	2,73
Palmaceae	01	0,90	01	0,91
Papavéraceae	01	0,90	01	0,91
Plantaginaceae	04	3,60	02	1,82
Poaceae	14	12,61	08	7,27
Primulaceae	01	0,90	02	1,81
Renonculaceae	02	1,80	01	0,91
Résédaceae	02	1,80	03	2,73
Rhamnaceae	01	0,90	03	2,73
Rosaceae	01	0,90	01	0,91
Rubiaceae	03	2,70	01	0,91
Rutaceae	/	/	01	0,91
Thymelaeaceae	01	0,90	01	0,91
Valérianaceae	01	0,90	/	/

For the biogeographical types, we notice a typically Mediterranean dominance in the two stations. A percentage of 52.73% in Ghazaouet and 36.94% in Sidi Djilali, then we have the W- Mediterranean with a value of 5.45% at the level of the Ghazaouet station and 7.21% at the level of Sidi Djilali (Table 7).

Table 7: Percentage of biogeographic types in the Ghazaouet station

	Ghazaouet 2000		**Ghazaouet 2019**	
Biogeographic types	**Nmbr of sp**	**%**	**Nmbr of sp**	**%**
Bét. Rif	/	/	01	1,23
CircumBor.	01	1,82	/	/
Circum-Méd.	02	3,64	03	3,70
Cosmp	01	1,82	/	/
End N-A /Méd	01	1,82	/	/
End.	01	1,82	01	1,23
End.N.A	01	1,82	03	3,70
End-Sah	01	1,82	/	/
Eur. Méd	/	/	03	3,70
Euras	02	3,64	01	1,23
Euras. Af. Sept	/	/	01	1,23
Eur-Méd	01	1,82	01	1,23
Ibér. Baléares. Sicile. N.A.	/	/	01	1,23
Ibéro. Maurit. Malte.	01	1,82	01	1,23
Ibero-magrebi	/	/	01	1,23
Ibéro-Maur	03	5,45	04	4,94
Macar-Méd.	02	3,64	/	/
Macar-Méd-Irano-Tour	01	1,82	/	/
Madère. W. Méd.	/	/	01	1,23
Méd.	29	52,73	34	41,98
Méd.Irano. Tour.	/	/	01	1,23
Méd-As	/	/	01	1,23
MED-ATL	01	1,82	01	1,23
mérid. A.N	01	1,82	01	1,23
Paléo-Subtrop	01	1,82	02	2,47
PALEO-TEMP	01	1,82	02	2,47
Sub-Méd	/	/	01	1,23
SUB-COSMOP	01	1,82	/	/
W-Méd	03	5,45	16	19,75

Table 8: Percentage of biogeographic types in the Sidi Djilali resort

	Sidi Djilali 2000		Sidi Djilali 2019	
Biogeographic types	**Nmbr of sp**	**%**	**Nmbr of sp**	**%**
A.N. Sicile-Sard	01	0,90	/	/
Asie - Occid	01	0,90	/	/
ATL-MED	01	0,90	/	/
CANAR-MED	/	/	02	1,82
CIRCUM-BOR	01	0,90	01	0,91
Circum-Méd	07	6,31	04	3,64
COSMP	02	1,80	02	1,82
E Méd	01	0,90	/	/
End	01	0,90	02	1,82
End. N. Sah	01	0,90	/	/
END-ALG-MAR	/	/	01	0,91
End-N-A	04	3,60	03	2,73
ESP-N-A	/	/	01	0,91
Eur- Méd	01	0,90	04	3,64
EUR-AS	/	/	07	6,36
Euras.	05	4,50	01	0,91
EURAS. N. A. TRIP	01	0,90	01	0,91
EURAS-AJ-SEPT	01	0,90	01	0,91
EUR-MERID-NA	/	/	01	0,91
Euryméd.	03	2,70	01	0,91
IBER-MAURIT-MALTE	/	/	01	0,91
Ibéro-Maur	05	4,50	03	2,73
Ib-Maur-Cen	01	0,90	/	/
MACAR –MED	02	1,80	02	1,82
Macar.-Euras	01	0,90	/	/
MACAR.MED.ETHIOP.INDE	/	/	01	0,91
MACAR-MED- IRANO-TOUR	01	0,90	01	0,91
Madère W. Méd	01	0,90	/	/
Méd.	41	36,94	43	39,09
Méd. Sah.-Iran-Tour	01	0,90	/	/
MED-AS	01	0,90	/	/
MED-ATL	02	1,80	02	1,82
Méd-Iran-Tour	02	1,80	01	0,91
N.A.-Sicile	01	0,90	/	/
NA	/	/	01	0,91
NA-TRIP	/	/	01	0,91
PALEO-SUBTROP	02	1,80	02	1,82
Paleo-Temp.	04	3,60	04	3,64
S. Méd	02	1,80	/	/
SAH	01	0,90	01	0,91
SAH-SUB-MED	01	0,90	/	/
S-MED-SAH	01	0,90	01	0,91
SUB-COSM	01	0,90	02	1,82
SUB-MED	01	0,90	02	1,82
W-Méd.	08	7,21	10	9,09

Comparison between the vegetation states of 2000 and 2019

If we compare the floristic tables of the two periods (2000 and 2019) for the two stations, we see an increase in the number of species for the Ghazaouet station, it goes from 55 species to 81, while for the Sidi station Djilali a stability in number of species is noticed (Table 9).

This change is also reflected in the disappearance of 45 species in Ghazaouet and the appearance of 71 new species. The disappearance also of 66 species against an appearance of 65 new species at the level of the station of Sidi Djilali.

Among the species that have disappeared in the Ghazaouet station are :*Juniperus phoenicea*, *Olea europea*, *Quercus ilex* and *Tetraclinis articulata*. The species that have appeared are :*Gennaria diphylla*, *Hippocrepis mulisiliquosa*, *Plantago*, etc.

For the region of Sidi Djilali we can cite as an example the disappearance of *Juniperus oxycedrus*, *Rosmarinus officinalis*, *Marrubium vulgar* and others. For the species that have appeared we have :*Arbutus unedo*, *Calendula arvensis*, *Teucrium polium*, etc.

This change in the values of the number of species necessarily introduces a percentage change in morphological,

biological and biogeographic types as well as systematic composition.

For the Ghazaouet station, there is a decrease in the percentages of morphological types, it is from 36.36% to 23.46% for annual grasses, from 52.73% to 51.85% for perennial woody plants and a increase from 10.91% to 24.69% for perennial grasses.

Two increases are also noted for the Sidi Djilali station in terms of perennials, from 33.33% to 34.55% for herbaceous plants and from 8.11 to 16.36 for woody plants. On the other hand, annual herbaceous plants have decreased from 58.56% to 49.09%.

Regarding the biological types the variations were as follows : An increase in chamephytes (from 32.73% to 43.21%), hemicryptophytes (from 7.27% to 12.35%) and geophytes (from 3.64% to 11,11%) for the Ghazaouet region followed by a decrease in therophytes (from 32.73% to 23.46%) and phanerophytes (from 23.64% to 9.88%). For the second station of Sidi Djilali, the increase in values was at the level of chamephytes (from 25.23% to 30.91%) and phanerophytes (from 2.70% to 10%) and a decrease for the other types (Thérohytes : from 41.44% 38.18%, Hemicryptophytes :from 20.72% to 11.82% and Geophytes : from 9.91% to 9.09%).

Regarding the botanical families, we noted many changes where there is even a disappearance or appearances of the families between the two periods and for the two stations.

The number of families inventoried is increasing for the two stations (30 in 2000 against 32 in 2019 for Ghazaouet and 29 in 2000 against 35 in 2019 for Sidi Djilali).

This increase implies disappearances and appearances at the level of families, because we noted at the level of the Ghazaouet station in 2019, the disappearance of 07 families and the appearance of 09 new families. While for the Sidi Djilali station we have the disappearance of 02 families against the appearance of 08 new families.

For the Ghazaouet station, we noted the disappearance of several families such as Apocynaceae, Aristolochiaceae, Myrtaceae, Geraniaceae, ... In equivalent, we have the appearance of Apiaceae, Iridaceae, Orchidaceae, ...etc. (Table 9).

The other permanent families have marked a change in the number of species which can be summed up in an increase in numbers for Asteraceae, Borraginaceae, Cistaceae, Fabaceae,… ..and a decrease for Anacardiaceae, Oleaceae… .etc.

The change in these numbers is very remarkable for the Sidi Djilalli station or the appearance of several new families such as : Apiaceae, Ericaceae, Linaceae, Oleaceae, etc. and the disappearance of only two families which are the Crassulaceae and the Valerianaceae (Table 9).

For Apiaceae, Asteraceae, Fabaceae, Malvaceae and other families, an increase in the number of species is marked. Overall, the number of families inventoried has increased for our two plant stations.

Table 9 : Summary of the floristic diversity of the two stations between 2000 and 2019

	Ghazaouet	**Sidi Djilali**
Total number of species in 2000	55	111
Total number of species in 2019	81	110
Number of species not found in 2019	45	66
Number of new species in 2019	71	65
Number of families inventoried in 2000	30	29
Number of families inventoried in 2019	32	35
Number of families not found in 2019	07	02
Number of new families in 2019	09	08
Biogeographic types in 2000	20	36
Biogeographic type in 2019	22	32
Disappeared biogeographic types	07	13
Biogeographical types that have appeared	09	09

Finally for the biogeographic types, the dominance is still for the Mediterranean element with a value of 29 in 2000 and 34 in 2019 for the Ghazaouet region. Species of W-Med origin have increased dramatically from 3 in 2000 to 16 in 2019.

We still note a dominance of Mediterranean elements for the second station of Sidi Djilali with a value of 41 in 2009 and 43 in 2019; for the W-Med element we have 08 in 2009 and 10 in 2019; for the Circum-Med we note a decrease (07 in 2009 to 04 in 2019).

On the other hand, these stations have seen the appearance of 09 new biogeographic types in 2019 and the disappearance of 07 biogeographic types for Ghazaouet and 13 biogeographic types for Sidi Djilali.

Discussion

A total of 55 species inventoried in the littoral seems a very low number compared to that of the steppe where we meet 111 species, but this value becomes more important in 2019 where it increases to 81 species following the increase in precipitation. It remains almost stable with 110 species in the steppe zone.

Biologically, the coastal part (Ghazaouet) and the steppe part (Sidi Djilali) have experienced chaméphytisation of the plant cover.

Quézel (2000) points out that one of the reasons likely to account for this richness in the Mediterranean region is undoubtedly its richness in Therophytes.

Kadi Hanifi (2003) confirmed that the regression of steppe formations generally results in chamephytisation by thorny species devoid of economic interest and neglected by livestock.

In our case, there is an increase in chamephytes for the Ghazaouet region, moreover the increase is noted even for the other types except the phanerophytes and the therophytes which regressed.

The Sidi Djilali station has undergone a regression at the level of three biological types (Therophytes, Hemicryptophytes and Geophytes).

This regression is reflected by the influence of several factors, mainly human action. This has already been reported by Nedjraoui *et al*. (2008) or they confirmed that On the human level, the demographic growth of the steppe zones is stronger than that recorded in the rest of the country.

The intense anthropization and pollution that our study area continues to suffer explains the invasion of Therophyte species which are generally annual herbaceous plants, which is shown in Table 6.

Climatic conditions can have some influence on the dynamics of vegetation. Quézel (2000) asserts that the current climatic conditions are not a favorable factor for this reconstitution. On the other hand in this study we notice that after 2000 there was a certain increase in rainfall on the coast (Ghazaouet station) which created certain favorable conditions for a dynamic rather progressive than regressive. This climatic influence is reflected in the increase in the number of species and botanical families recorded between 2000 and 2019. This improvement in climatic factors is reflected in the appearance of Orchids on the coast.

The improvement of these climatic conditions is also marked by a certain decrease in the dry period of this station.

Vegetation plays a fundamental role in the structure and functioning of the ecosystem, of which it constitutes an expression of biological potential. However, the natural vegetation cover is subject to a double edaphoclimatic stress on the one hand and anthropogenic on the other hand (Bouchetata *et al*., 2010).

Despite the improvement in climatic conditions, anthropogenic action has its influence on the degradation of the vegetation cover.

Bouazza et*al*. (2010) confirmed that Tlemcen is one of the richest regions in plant biodiversity combined with high endemism, but this region has undergone very significant and relatively recent human action. Man continuously exercises his destroying action, as is the case with our coastline or the realization of a motorway project leading to a series of disappearances of trees, this is well reflected in the results cited above. Or the number of phanerophytes to decrease from 23.64% to 9.88%.

Di Castri (1981) and Quézel (1989) show that intense anthropic action (deforestation, fire, grazing, cultivation and various crimes) leads to a decrease in forest areas, estimated at between 1 and 3% per year (Quézel *et al*., 1990), formed mainly by pre-forest, chamaephytic and nano-phanerophytic species, which explains the total disappearance of evergreen tree forests in the Mediterranean region and their replacement by fairly open environments, which occupy almost the entire forest.

Fires also play a big role in modifying the vegetation cover. According to Benderradji *et al*. (2004), during the decade 1990-2000, forest fires covered the equivalent of 155,285 hectares in northeastern Algeria.

Every year, fires devastate considerable areas of forests in the state of Tlemcen. During the period 2010-2015, 227 declared outbreaks wiped out an area of 52 38.8 ha (Houacine, 2016).

Conclusion

The diachronic study of the evolution of vegetation in the Tlemcen region shows that between the period of 2000 and 2019, there is a certain progressive dynamic, especially in the Ghazaouet region.

Species, families and biogeographic types have appeared and disappeared on the coast as well as on the steppe.

This progressive floristic dynamic is partly due to the climatic conditions which have evolved especially in the resort of Ghazouet.

It is true that this finding is stationary, but it may prompt us to step up our studies in this direction to answer several questions : Are the changes that have appeared temporary ? Does the anthropogenic effect have more influence than the climate side on the evolution of vegetation.

It is very important to study other stations to be able to come out with more confirmed conclusions.

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APPENDICES

Species inventoried in the Ghazaouet 2000 station

Taxa	Families	Morphological type	Biological type	Biogeographic type
Ampelodesmos mauritanica	Poaceae	LV	CH	W-Méd
Anagallis arvensis subsp phonicea	Primulaceae	HA	TH	Sub-Cosmop
Anthyllis tetraphylla	Fabaceae	HA	TH	Med
Aristolochia baetica	Aristolochiaceae	HA	GE	Ibero-Mar
Asparagus stipularis	Liliaceae	HV	GE	Macar-Med
Asteriscus maritimus	Asteraceae	LV	CH	Merid.AN
atractylis humilis	Asteraceae	HV	HE	Ibéro-Maur
avena sterilis	Poaceae	HA	TH	Macar-Méd-Irano-Tour
Bellis annua	Asteraceae	HA	TH	Circum-Méd.
Bromus lanceolatus	Poaceae	HA	TH	Paleo-Temp
Bromus rubens	Poaceae	HA	TH	Paléo-Subtrop
Calycotome villosa sub termedia	Fabaceae	LV	CH	Méd
Centaurea pullata	Asteraceae	HA	TH	Méd
Ceratonia siliqua	Cesalpinaceae	LV	PH	Méd
Chamaerops humilis	Palmaceae	LV	CH	W-Méd
chrysanthemum coronarium	Asteraceae	HA	TH	Méd.
Chysanthemum grandiflorum	Asteraceae	HA	TH	Méd.
Cistus monspeliensis	Cistaceae	LV	CH	Méd.
Cistus villosus	Cistaceae	LV	CH	Méd
Convolvulus althaeoides	Convolvulaceae	HA	TH	Macar-Méd.
Daphne gnidium	Thymelaeaceae	HV	CH	Méd.
Echium vulgare	Boraginaceae	HA	HE	Méd.
Erica arborea	Ericaceae	LV	CH	Méd
Erica multiflora L.	Éricaceae	LV	CH	Méd.
Erodium moschatum	Geraniaceae	HA	TH	Méd
Euphorbia paralias	Euphorbiaceae	LV	CH	Med-Atl
Genista tricuspidata	Fabaceae	LV	CH	End.N.A
Globularia alypum	Globulariaceae	LV	CH	Méd
Hordeum murinum	Poaceae	HA	TH	Circumbor.
Juniperus phoenicea	Cupressaceae	LV	PH	Circum-Med
ligustrum japonicum	Oleaceae	LV	PH	Euras
Marrubium vulgare	Lamiaceae	HV	HE	Cosmp
Myrtus communis	Myrtaceae	LV	PH	Med
Nerium oleander	Apocynaceae	LV	PH	Méd
Olea europea	Oleaceae	LV	PH	Méd
Pallenis spinosa	Asteraceae	HV	HE	Eur-Méd
Phillyrea angustifolia	Oleaceae	LV	PH	Méd
Pinus marítima	Pinaceae	LV	PH	Méd.
Pistacia lentiscus L.	Anacardiaceae	LV	PH	Méd
Pistacia terebinthus	Anacardiaceae	LV	PH	Méd.
Plantago lagopus	Plantaginaceae	HA	TH	Méd.
prasium majus	Lamiaceae	LV	CH	Med
Quercus coccifera	Fagaceae	LV	PH	Méd
Quercus ilex	Fagaceae	LV	PH	Méd
Raphanus raphanistrum	Brassicaceae	HA	TH	Méd
rosmarinus tournefortii	Lamiaceae	LV	CH	End.

Scorpiurus muricatus	Fabaceae	HA	TH	Méd
scrophularia laevigata	Scrophulariaceae	HA	TH	End N-A /Méd
Sedum acre	Crassulaceae	HV	CH	Euras
silene colorata	Caryophyllaceae	HA	TH	Méd
Tetraclinis articulata	Cupressaceae	LV	PH	Ibéro. Maurit. Malte.
Teucrium fruticans	Lamiaceae	LV	CH	Med
Teucrium pseudochamaepitys	Lamiaceae	HA	TH	W-Méd
Ulex boivini	Fabaceae	LV	CH	Ibéro-Mar
Ziziphus lotus	Rhamnaceae	LV	CH	End-Sah

Species inventoried in the Sidi Djilali 2000 station

Taxa	Families	Morphological type	Biological type	Biogeographic type
Aegilops triunciatis	Poaceae	HA	TH	Med-Irano-Tour
aegilops ventricosa	Poaceae	HA	TH	W-Med
Ajuga iva	Lamiaceae	HA	TH	Med
Allium paniculatum	Liliaceae	HV	GE	Méd
Alyssum compestre	Brassicaceae	HA	TH	Med
Anagallis arvensis sp latifolia	Primulaceae	HA	GE	Sub-Cosm
Artemesia herba-alba	Asteraceae	LV	CH	Asie - Occid
Asparagus acutifolius	Liliaceae	HV	GE	Med
Asperula hirsuta	Rubiaceae	HA	TH	W-Méd.
Asphodelus microcarpus	Liliaceae	HV	GE	Canar-Med
Astragalus armatus	Fabaceae	HV	CH	End-N A
Atractylis carduus	Asteraceae	HV	CH	Sah
Atractylis serratuloides	Asteraceae	HV	CH	Med
Atractytis cancellata	Asteraceae	HA	TH	Circum-Med
Atractytis humilis	Asteraceae	HV	HE	Ibéro-Maur
Avena sterils	Poaceae	HA	TH	Macar-Med-Irano-Tour
Bellis annua	Asteraceae	HA	TH	Circum-Med
Biscutella auriculata	Brassicaceae	HA	TH	Méd
Brachypodium distachyum	Poaceae	HA	TH	Paleo-Sub-Trop
Bromus rubens	Poaceae	HA	TH	Paleo-Subtrop
Bupleurum semicompositum	Apiaceae	HV	HE	W.Méd
Carthamus caeruleus	Asteraceae	HA	TH	Med
Centaurea calcitrapa	Asteraceae	HV	HE	Euryméd.
Centaurea incana	Asteraceae	HV	HE	Ibero-Maur
Centaurea solstitialis	Asteraceae	HV	CH	Med-As
centaurea nana	Asteraceae	HV	HE	Med
Ceratocephalus falcatus	Renonculaceae	HA	CH	Méd-Iran-Tour
Chamaerops humilis	Palmaceae	LV	PH	W.Med
chrysanthemum coronarium	Asteraceae	HA	TH	Méd
Convolvulus althaeoïdes	Convolvulaceae	HA	HE	Macar –Med
Coronilla scorpioides	Fabaceae	HA	CH	Med
Crucianella hirta	Rubiaceae	HV	HE	End. N. Sah
ctenopsis pectinella	Poaceae	HV	HE	S. Méd
Dactylis glomerata	Poaceae	HV	HE	Paleo-Temp
delphinium peregrinum	Renonculaceae	HA	HE	Méd
Echinops spinosus	Asteraceae	HV	CH	S-Med-Sah
Echium pycnanthum	Boraginaceae	HA	HE	Med
Erodium guttatum	Geraniaceae	HA	TH	Sah- Méd
Erodium moschatum	Geraniaceae	HA	TH	Med
Eryngium ilicifolium	Apiaceae	HA	HE	Ibéro-Maur
Eryngium triquetrum	Apiaceae	HV	HE	N.A.-Sicile
Euphorbia exigua	Euphorbiaceae	HA	HE	Eur
Euphorbia falcata	Euphorbiaceae	HA	TH	Eur-Méd
Evax pygmaea	Asteraceae	HA	TH	Circumméd
Ferula communis	Apiaceae	HV	CH	Med
Filago spathulata	Asteraceae	HA	TH	Med
Fumana thymifolia	Cistaceae	HA	CH	Euras-Aj-Sept
genista tricuspidata	Fabaceae	LV	CH	End-N-A
Gnophelium luteo-elbum	Asteraceae	HA	TH	Cosmp
Hedypnois cretica	Asteraceae	HA	TH	Med

helianthemum vesicarium	Cistaceae	HA	CH	Med
helianthemum apertum	Cistaceae	HA	CH	End. N.A.
Herniaria fontanesii	Caryophyllaceae	HA	TH	Ib-Maur-Cen
Hippocrepis murisiquosa	Fabaceae	HA	HE	Med
Hordeum murinum	Poaceae	HA	TH	Circum-Bor
Juniperus oxycedrus	Cupressaceae	LV	PH	Circum-Méd
Koelpinia linearis	Asteraceae	HA	HE	Méd. Sah.-Iran-Tour
Lavatera alba	Malvaceae	HA	TH	Méd
Lavendule stoeches	Lamiaceae	HV	CH	Méd
Lithospermum tenuiflorum	Boraginaceae	HA	TH	E Méd
Lygeum spartum	Poaceae	HV	GE	West-Méd
magydaris panacifolia	Apiaceae	HV	CH	A.N. Sicile-Sard
Malva aegyptiaca	Malvaceae	HA	TH	Sah-Sub-Med
Medicago minima	Fabaceae	HA	TH	Eur-Méd
Medicago rugulosa	Fabaceae	HA	TH	Med
melilotus sulcata	Fabaceae	HA	TH	Méd
Marrubium vulgare	Lamiaceae	HA	CH	Cosm
Micropus bombicinus	Asteraceae	HA	TH	Euras. N. A. Trip
minuartia montana	Caryophyllaceae	HA	TH	Méd
Ononis natrix	Fabaceae	LV	CH	Méd.
ornithogalum umbellatum	Liliaceae	HV	GE	Atl-Med
Oryzopsis paradoxa	Poaceae	HV	GE	Madère W. Méd
quercus ilex	Fagaceae	LV	PH	Méd
Papaver rhoeas	Papaveraceae	HA	TH	Paleo-Temp
Paronychia argentea	Caryophyllaceae	HV	HE	Med
pallenis spinosa	Asteraceae	HV	CH	Eur- Méd
Phagnalon saxatile	Asteraceae	HV	HE	W-Med
plantago albicans	Plantaginaceae	HA	TH	Méd
Plantago serraria	Plantaginaceae	HA	HE	Méd
Plantago ovata	Plantaginaceae	HA	TH	Méd
Plantago psyllium	Plantaginaceae	HA	TH	Sub-Med
Reseda alba	Resedaceae	HA	TH	Euras
Reseda phyteuma	Resedaceae	HA	TH	Med
Rosmerinus officinalis	Lamiaceae	LV	CH	Méd.
Rubia peregrina	Rubiaceae	HA	HE	Med-Atl
Salvia verbenaca	Lamiacea	HV	CH	Med-Atl
Sanguisorba minor	Rosaceae	HV	HE	Euras
Scabiosa stellata	Dipsacaceae	HA	TH	W-Med
Schismus barbatus	Poaceae	HA	TH	Macar-Med
Scleropoa rigida	Poaceae	HV	GE	Macar.-Euras
Scorzonera undulata	Asteraceae	HV	HE	End
scolymus hispanicus	Asteraceae	HV	HE	Méd.
sedum caespitosum	Crassulaceae	HA	TH	Med
Sedum rubens	Crassulaceae	HA	TH	Med
Sidieritis montana	Lamiaceae	HA	CH	Med
Silene gallica	Caryopgyllaceae	HA	TH	Paleo-Temp
Sinapis arvensis	Brassicaceae	HA	TH	Paléo-Temp
Stipa pennata	Poaceae	HV	GE	Euras.
Stipa tenacissima	Poaceae	HV	GE	Iber-Maur
Teucrium fruticans	Lamaiceae	LV	CH	Med
Teucrium pseudo-chamaepitys	Lamiaceae	HA	CH	W-Med
Thapsia garganica	Apiaceae	HV	CH	Med
thymelaea passerina	Thymelaeaceae	HA	CH	Euras
Thymus ciliatus	Lamiaceae	HV	CH	End.NA
Tragopogon porrifolius	Asteraceae	HA	TH	Circum-Med
Ulex boivinii	Fabaceae	HV	CH	Iber-Mar
Urginea maritima	Liliaceae	HV	GE	Canar-Med
valerianella coronata	Valerianaceae	HA	TH	Méd.
velezia rigida	Caryophyllaceae	HA	TH	Méd.
Ziziphus lotus	Rhamnaceae	LV	CH	Med
Zizyphora capitata	Lamiaceae	HA	TH	Med

Species inventoried in the Ghazaouet station 2019

Taxa	Families	Morphological type	Biological type	Biogeographic type
Ampelodesmos mauritanica (Poiret) Durand & Schinz	Poaceae	LV	CH	W-Méd
Asteriscus maritimus	Asteraceae	LV	CH	Mérid.A.N
Asterolion linum-stellatum	Primulaceae	HA	TH	Méd
Anagallis monelli	Primulaceae	HV	HE	W-Méd
Aphyllanthes monspeliensis L.	Liliaceae	HV	GE	W-Méd
Ajuga iva	Lamiaceae	HV	HE	Méd
Asperula hirsuta	Rubiaceae	HA	TH	W-Méd.
Bupleurum gibraltaricum	Apiaceae	LV	CH	Ibéro-Maur
Bupleurum balansae Boiss et Reut	Apiaceae	LV	CH	End. N.A
Bellis sylvestris	Asteraceae	HV	HE	Circum-Med.
Brachypodium ramosum L.	Poaceae	HV	GE	Circum-Med.
Brachypodium distachyum L.	Poaceae	HA	TH	Paléo-Subtrop.
Brachypodium sylvaticum (Huds.) P. B.	Poaceae	HV	GE	Paleo-Temp
Bromus rubens	Poaceae	HA	TH	Paléo-Subtrop
Ceratonia siliqua	Cesalpinaceae	LV	PH	Méd
Chamaerops humilis	Palmaceae	LV	CH	W-Méd
Carlina lanata	Asteraceae	HA	TH	Circomméd
Cistus albidus	Cistaceae	LV	CH	Méd.
Cistus clusii = C. Libanotis L.	Cistaceae	LV	CH	Ibér. Baléares. Sicile. N.A.
Cistus salvifolius L.	Cistaceae	LV	CH	Euras-Méd.
Coris monspeliensis L.	Primulaceae	HA	TH	Méd
Centaurea seridis	Asteraceae	HA	TH	W-Méd.
Cupressus sympervirens	Cupressaceae	LV	PH	Méd
Ebenus pinnata	Fabaceae	HV	HE	End. N.A
Erica multiflora L.	Ericaceae	LV	CH	Méd.
Euphorbia falcata	Euphorbiaceae	HA	TH	Méd-As
Fagonia cretica	Zygophyllaceae	LV	CH	Méd.
Fumana thymifolia	Cistaceae	LV	CH	Euras. Af. Sept
Fumana loevipes	Cistaceae	LV	CH	Eur. Méd
Galium mollugo	Rubiaceae	HV	HE	Méd
Genista erioclada Spach.	Fabaceae	LV	CH	End
Genista umbellata	Fabaceae	LV	CH	Bét. Rif
Genista romosissima (Desf.) Poiret	Fabaceae	LV	CH	W-Méd.
Gennaria diphylla	Orchidaceae	HV	GE	W-Méd.
Gladiolus italicus =G. segetum	Iridaceae	HV	GE	Méd
Globularia alypum	Globulariaceae	LV	CH	Méd
Helianthemum lavanduloefolium	Cistaceae	LV	CH	Eur. Méd
Helianthemum sp.	Cistaceae	LV	CH	W-Méd
Hedysarum spinosissimum	Fabaceae	HA	TH	Méd.
Helichrysum stoechas	Asteraceae	HV	HE	W-Méd
Hippocrepis multisiliquosa L.	Asteraceae	HA	TH	Méd
Lavandula dentata	Lamiaceae	LV	CH	W-Méd.
Lotus ornithopodioides L	Fabaceae	HA	TH	Méd
Lithospermum fruticosum subsp. diffusum (Lag.) Maire	Borraginaceae	LV	CH	W-Méd.
Micromeria inodora	Lamiaceae	LV	CH	Ibéro-Maur.
Neatostema apulum	Borraginaceae	HA	TH	Méd
Ophrys fusca subsp. maghribeca Kreutz , Rebbas , Babali , Miara & Ait -Hammou	Orchidaceae	HV	GE	Méd.
Ophrys tenthredinifera Willd. subsp. thenthredinifera	Orchidaceae	HV	GE	Méd.
Orchis coriophora L.	Orchidaceae	HV	GE	Méd
Osyris lanceolata = Osyris quadripartita Decne	Santalaceae	LV	PH	Ibero-Maur
Ozyropsis miliaca	Poaceae	LV	CH	Méd.Irano.Tour
Paronychia argentea	Caryophyllaceae	HV	HE	Méd

Phagnalon saxatile	Asteraceae	LV	CH	W-Méd.
Phagnalon rupestre (L.) DC.	Asteraceae	HV	HE	Méd
Phillyrea angustifolia	Oleaceae	LV	PH	Méd
Pinus halepensis Mill	Pinaceae	LV	PH	Méd.
Pistacia lentiscus L.	Anacardiaceae	LV	PH	Méd
Plantago psyllium L.	Plantaginaceae	HA	TH	Sub-Méd
Plantago afra	Plantaginaceae	HA	TH	Méd
Quercus coccifera	Fagaceae	LV	PH	Méd
Reseda phyteuma	Resedaceae	HA	TH	Euras.
Rechelia disperma	Borraginaceae	HA	TH	Méd
Rhamus alaternus	Rhamnaceae	LV	CH	Méd
Rosmarinus officinalis	Lamiaceae	LV	CH	Méd
Rosmarinus eriocalyx= R. tournefortii	Lamiaceae	LV	CH	Méd
Ruta chalepensis L.	Rutaceae	LV	CH	Méd
Rubia peregrina L.	Rubiaceae	HV	CH	Méd- Atl.
Stipa tenacissima	Poaceae	LV	CH	Ibéro-Maur.
Serratula flavescens (L.) Poir.	Asteraceae	HV	HE	Ibero-Magrebi
Sonchus asper	Asteraceae	HV	HE	Méd
Sinapis arvensis	Brassicaceae	HA	TH	Paléo-Temp.
Scilla peruviana	Liliaceae	HV	GE	Madère. W. Méd.
Tetraclinis articulata	Cupressaceae	LV	PH	Ibéro. Maurit. Malte.
Teucrium polium subsp. capitatum	Lamiaceae	LV	CH	Eur- Méd
Teucrium pseudochamaepitys	Lamiaceae	HA	TH	W-Méd
Thymus munbyanus	Lamiaceae	LV	CH	End. N.A.
Thymelaea argentea	Thymelaeaceae	LV	CH	Méd.
Thymelaea granatensis	Thymelaeaceae	LV	CH	Méd.
Ulex parviflorus	Fabaceae	LV	CH	W-Méd.
Viola arborescens	Violaceae	LV	CH	W-Méd
Vella annua L	Brassicaceae	HA	TH	Méd.

Species inventoried in the Sidi Djilali resort 2019

Taxa	Families	Morphological type	Biological type	Biogeographic type
Adonis annua	Renonculaceae	HA	TH	Euras
Aegilops triuncialis	Poaceae	HA	TH	Med-Irano-Tour
Ajuga chamaepitys	Lamiaceae	HA	TH	Euras.Med
Alyssum campestre	Brassicaceae	HA	TH	Med
Anagalis monelli	Primulaceae	HA	TH	W-Med
Anagallis arvensis	Primulaceae	HA	GE	Sub-Cosm
Arbutus unedo	Ericaceae	LV	PH	Med
Arisarum vulgare	Araceae	HA	GE	Circummed
Asparagus acutifolius	Liliaceae	HV	GE	Med
Asparagus stipularis	Liliaceae	HV	GE	Macar-Med
Asphodelus microcarpus	Liliaceae	HV	GE	Canar-Med
Astragalus armatus	Fabaceae	HV	CH	End-N A
Atractylis cancellata	Asteraceae	HA	TH	Circum-Med
Atractylis carduus	Asteraceae	HV	CH	Sah
Avena sterilis	Poaceae	HA	TH	Macar-Med-Irano-Tour
Bellis annua	Asteraceae	HA	TH	Circum-Med
Biscutella didyma	Brassicaceae	HA	TH	Med
Bromus rubens	Poaceae	HA	TH	Paleo-Subtrop
Calendula arvensis	Asteraceae	HA	TH	Sub-Med
Calendula suffruticosa	Asteraceae	HA	TH	Esp-N-A
Calycotome intermedia	Fabaceae	LV	CH	W□Med
Carlina aconthifolia	Asteraceae	HV	HE	End
Carthamus caeruleus	Asteraceae	HA	TH	Med
Catananche coerulea	Asteraceae	HV	HE	W-Med
Centaurea pullata	Asteraceae	HA	TH	Med
Cephalaria leucantha	Dipsacaceae	HV	CH	W-Med
Ceratonia siliqua	Fabaceae	LV	PH	Med
Chamaerops humilis	Palmaceae	LV	PH	W.Med

Chrysanthemum grandiflorum	Asteraceae	HV	CH	End
Chrysanthemum segetum	Asteraceae	HV	HE	Sub-Cosm
Cistus albidus	Cistaceae	HV	CH	Med
Cistus monspeliensis	Cistaceae	HV	CH	Med
Cistus villosus	Cistaceae	HV	CH	Euras.Med
Convolvulus althaeoïdes	Convolvulaceae	HA	HE	Macar -Med
Coronilla scorpioides	Fabaceae	HA	CH	Med
Dactylis glomerata	Poaceae	HV	HE	Paleo-Temp
Daphne gnidium	Thymelaeaceae	HV	CH	Med
Echinops sphaerocephalus	Asteraceae	HV	HE	Med
Echinops spinosus	Asteraceae	HV	CH	S-Med-Sah
Erica arborea	Ericaceae	LV	CH	Med
Erodium moschatum	Geraniaceae	HA	TH	Med
Eryngium maritimum	Apiaceae	HV	CH	Eur-Med
Euphorbia peplus	Euphorbiaceae	HA	TH	Cosm
Evax argentea	Asteraceae	HA	TH	Na-Trip
Ferula communis	Apiaceae	HV	CH	Med
Fumana thymifolia	Cistaceae	HA	CH	Euras-Aj-Sept
Geropogon glaber	Asteraceae	HA	TH	Eury- Med
Gladiolus byzantinus	Iridaceae	HA	GE	Med
Gladiolus segetum	Iridaceae	HA	TH	Med
Helianthemum helianthemoïdes	Cistaceae	HV	CH	End-N A
Helianthemum hirtum	Cistaceae	HV	CH	Na
Helianthemum virgatum	Cistaceae	HV	CH	Ibero-Maur
Hordeum murinum	Poaceae	HA	TH	Circum-Bor
Iris tingitana	Iridaceae	HA	GE	End-Alg-Mar
Knautia ervensis	Dipsacaceae	HV	CH	Eur-As
Linum strictum	Linaceae	HA	TH	Med
Linum suffruticosum	Linaceae	HA	TH	W-Med
Lithospermum apulum	Boraginaceae	HA	TH	Med
Lobularia maritima	Brassicaceae	HA	TH	Med
Lolium rigidum	Poaceae	HA	TH	Paleo-Subtrop
Lonicera implexa	Caprifoliaceae	LV	CH	Med
Malva sylvestris	Malvaceae	HA	HE	Euras
Marrubium vulgare	Lamiaceae	HA	CH	Cosm
Medicago rugulosa	Fabaceae	HA	TH	Med
Melica minuta	Poaceae	HA	TH	Med
Micropus bombicinus	Asteraceae	HA	TH	Euras. N. A. Trip
Muscari comosum	Liliaceae	HV	GE	Med
Olea europaea	Oleaceae	LV	PH	Med
Olea europaea var. oleaster	Oleaceae	LV	PH	Med
Papaver rhoeas	Papaveraceae	HA	TH	Paleo-Temp
Paronychia argentea	Caryophyllaceae	HV	HE	Med
Phagnalon saxatile	Asteraceae	HV	HE	W-Med
Phillyrea angustifolia	Oleaceae	LV	PH	Med
Pistacia lentiscus	Anacardiaceae	LV	PH	Med
Plantago lagopus	Plantaginaceae	HA	TH	Med
Plantago psyllium	Plantaginaceae	HA	TH	Sub-Med
Prasium majus	Lamiaceae	LV	CH	Med
Quercus ilex	Fagaceae	LV	PH	Med
Raphanus raphanistum	Brassicaceae	HA	TH	Med
Reseda alba	Resedaceae	HA	TH	Euras
Reseda lutea	Resedaceae	HA	TH	Eur
Reseda phyteuma	Resedaceae	HA	TH	Med
Rhamnus alaternus	Rhamnaceae	LV	PH	Med
Rhamnus lycioides	Rhamnaceae	LV	PH	W-Med
Rubia peregrina	Rubiaceae	HA	HE	Med-Atl
Ruta chalepensis	Rutaceae	HV	CH	Med
Salvia verbenaca	Lamiaceae	HV	CH	Med-Atl
Sanguisorba minor	Rosaceae	HV	HE	Euras
Satureja calamintha	Lamiaceae	HV	HE	Euras

Scabiosa stellata	Dipsacaceae	HA	TH	W-Med
Scolymus hispanicus	Asteraceae	HV	HE	Med
Scorpiurus muricatus	Fabaceae	HA	TH	Med
Senecio cineraria	Asteraceae	HV	CH	Eur-Merid-Na
Sidieritis montana	Lamiaceae	HA	CH	Med
Silene conica	Caryophyllaceae	HA	TH	Euras
Sinapis alba	Brassicaceae	HA	TH	Paleo-Temp
Sinapis arvensis	Brassicaceae	HA	TH	Paleo-Temp
Smilax aspera	Liliaceae	LV	CH	Macar.Med.Ethiop.Inde
Stipa tenacissima	Poaceae	HV	GE	Iber-Maur
Tetraclinis articulata	Cupressaceae	LV	PH	Iber-Maurit-Malte
Teucrium fruticans	Lamaiceae	LV	CH	Med
Teucrium polium	Lamiaceae	HV	CH	Eur-Med
Teucrium pseudo-chamaepitys	Lamiaceae	HA	CH	W-Med
Thapsia garganica	Apiaceae	HV	CH	Med
Thymus ciliatus	Lamiaceae	HV	CH	End-N A
Tragopogon porrifolius	Asteraceae	HA	TH	Circum-Med
Ulex boivinii	Fabaceae	HV	CH	Iber-Mar
Urginea maritima	Liliaceae	HV	GE	Canar-Med
Ziziphus lotus	Rhamnaceae	LV	CH	Med
Zizyphora capitata	Lamiaceae	HA	TH	Med