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Distribution study of some species of spontaneous Flora in two Saharan Regions of the North-East of Algeria (Ouargla and Ghardaïa)

BAAMEUR Malika[1]*, ABDELGUERFI[2], DADDI BOUHOUN Mostafa[1], SAADI Hacina[3] and OULD EL HADJ Mohamed[1]

[1]Kasdi Merbah University, Faculty of Nature Sciences and Life Laboratory of Protection of the Ecosystems in Arid and Semi-arid Zones BP 511, Ouargla 30000, Algeria.
[2]Inst. National Agronomique El-Harrach, El-Harrach Algérie 16200, Algeria
[3]University of Biskra BP RP 145, 07000 Biskra, Algeria.

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The botanical and edaphic inventory investigations of the spontaneous flora distribution in the regions of Ouargla and Ghardaïa revealed the presence of 56 taxa of which 32 were ephemeral and 24 vivacious. The sweeping operation of 6 stations over these two regions showed an abundant richness estimated to 39 species localized mainly in the beds of Wadis and distributed as follows: Reg (19), Sebkha (7), Erg (6) and Hamada (5). The average richness of species was about 4, 83 in the beds of Wadis and 0, 83 in Hamadas. The abundance and dominance of plants varied within the same species from one station to another. In fact, severe climato-edaphic conditions gave rise to isolated life. For example, Chamephytes dominate in dry and moderately humid environments as in the Reg of Hassi Ben Abdellah and Wadi N'sa. However, in humid zones such as the Wadi M'zab, it was therophytes that dominated. In these dry zones, the spontaneous plants were distributed according to their ecological affinities. The position of each species depended on different ecological factors such as dryness, soil and humidity.

Key words: Distribution, spontaneous flora, richness, soil, Sahara.

INTRODUCTION

Knowledge, classification, characterization and conservation of different taxa is a global scientific priority for the assessment and management of biodiversity and conservation (Cotterill, 1995). Efforts to study the flora are very important in the understanding of the great biological traits of plants and their biogeographical distribution (Lavergne et al., 2005). However, biological, taxonomic and ecological aspects of a considerable number of plant species remain unknown (Grubb, 1977; Pyšek et al., 2008).

For those who have not had the opportunity to explore

*Corresponding author. E-mail: baameurmalika@yahoo.fr. Tel: 0033633694631.

the desert bar by hearsay, the idea of the existence of spontaneous flora in the Sahara nevertheless would be strange. A short sojourn is sufficient to catch sight of the arid soil, which nourishes many plants decorated by flowers, sometimes curious sometimes with real beauty (Gubb, 1913). This testimony of such an eminent naturalist is a powerful motivation towards more discoveries of the Saharan flora secrets. The Sahara is the largest desert covering nearly eight million km^2, but also the most expressive and typical regarding its extreme aridity. Otherwise, the desert conditions reach their greatest harshness. The ground sheet vegetation is discontinuous and remarkably irregular. Plants mainly use places where water supply is slightly less unfavorable than elsewhere (Ozenda, 1983). Vegetation in arid areas, particularly that of the Sahara is very sparse, in appearance generally naked and bleak. The trees are rare as they are scattered and herbs are evident for a very short period of the year when conditions become favourable. This Saharan flora is adapted to dry climate and salty soil (Trabut and Mares, 1906). It appears poor if we compare the small number of species that live in this desert to the enormity of the surface that is covers. It includes only 1200 species.

Representing more than two thirds of the Algerian territory, arid and semi-arid regions are natural resources deserving great attention. The preservation of these ecosystems depends on increased knowledge and on the conservation of the biological diversity, especially of wild plants, which have developed specific qualities and adaptations in harmony with the extreme environmental conditions over thousands of years. Taking into account the fact that little information on the biodiversity of native flora in these arid regions of the northern Sahara is available, special attention is paid to the study of the distribution of its natural vegetation. The aim of the present survey was to establish the correlation between vegetation and arid soil and the delimitation of the wild plant distribution. In this region, vegetation has been seriously degraded as a consequence of a long history of desertification, resulting from a combination of factors such as drought, overgrazing and overcutting, such information is crucial for developing strategies, programs or technical guidelines for the conservation and sustainable utilization of natural resources.

MATERIALS AND METHODS

Area presentation

The investigated surface area covers 163.230 km^2. It is located at an average altitude of 157 m, at latitude 32° 45' / 31° 45' North/South and at longitude 5 ° 20 '/ 5 ° 45' East /West. It is a low altitude area lying from 30 to 200 m (Rouvillois – Brigol, 1975; Dubost, 1991). Ouargla and Ghardaia soils are derived from non-gypsum miopliocene clay- quartz sandstone. They consist of quartz sands. The sandy skeleton of the soils studied is very abundant, consisting almost entirely of quartz. The colour becomes less red and the film thickness decreases in high altitudes and especially in dunes. Despite its relative septentrional latitude, the climate is typically hot arid. Average temperatures are high, with absolute maxima in July–August exceeding 50°C, and minima in January ranging from 2 to 9°C (Le Houerou, 1990). However, the temperature rapidly deceases with depth. Because of low cloudiness, the sunlight in the Sahara Desert is relatively strong and has a drying effect by raising the temperature (Ozenda, 2004). Practically, precipitation always occurs as rain characterized by its slight importance; torrential rains are rare. Rains are related to Sudano-Saharan and Saharan meteorological disturbances (Dubief, 1963). Such insufficient Saharan rains are associated with a significant irregularity of rainfall patterns and a considerable interannual variability, which induce more or less lengthy severe droughts (Ozenda, 2004).

Selected stations

According to the Gounot method (1969), six representative area studies were selected. The selection criteria were based on the most distinguishing ecological factors of vegetation, especially the geomorphology and soil. Since that is the case, for salty soils, we chose the Sebkha of Bemendil (05°17'E.; 31°56'N) and the Reg of Hassi Ben Abdellah (05° 27′ E.; 31° 59′ N). The stony soils were represented by Hamada El Atchanne (32° 08' N.; 004°33'E) and finaly sandy soils were represented by Erg Sidi Khouiled (31° 58′ N, 5° 24′ E), Oued M'Zab (32° 23′ N, 4° 12′E) and Oued N'Sa (32° 27′ N, 5° 20′ E) (Figure 1).

Floristic data

Phyto-ecological surveys were conducted on the entire range of the spontaneous flora in the regions of Ouargla and Ghardaia. The sampling procedure took into account the vegetation structure and the floristico-ecological homogeneity criterion was privileged. The samples were collected using the subjective sampling method using and minimum area field technique (Gounot, 1969). This is a method of establishing a list of new species appearing in successive doubling of the surface. It is assumed to reach a surface (n) on which no new species appear. Some authors such as Gounot (1969) and Djebaili (1984) agree that the minimum area of 60 to 100 m2 is sufficiently representative in Mediterranean formations. For arid regions as is the case in the region of Ouargla, largely to offset the absence of certain plant species, we can sample over very large areas, for example from 50 to 1000 m square (Voisin, 1980). The determination of the observed species richness was calculated according to the Ramade method (1984). The total richness (S) is equal to N were n is the total number of species in biota. It is expressed as follows: S = sp1 +sp2+ sp3 + sp4 ..... spn, S: is the total number of species observed, and sp1 +sp2+ sp3+ sp4 ..... + spn: are the species observed.

The Average richness (Sm) is the average number of species recorded at each survey. It is obtained by the following formula: Sm = Σ S / N or S Σ = s_1, s_2, s_3, s_n .....: Sm is the sum of the number of species found for the N reported. N is the total number identified. Furthermore life forms of the recorded species were determined following the Raunkiær classification (Ellenberg and Mueller-Dombois, 1967). The spring season corresponds to the maximum development of floristic diversity especially for annual species; we chose this period to ensure a significant sampling. Also, by choosing a time when perennial species flower, we facilitated their identification (Ozenda, 1983).

Soil data

The floristic survey was systematically accompanied by soil

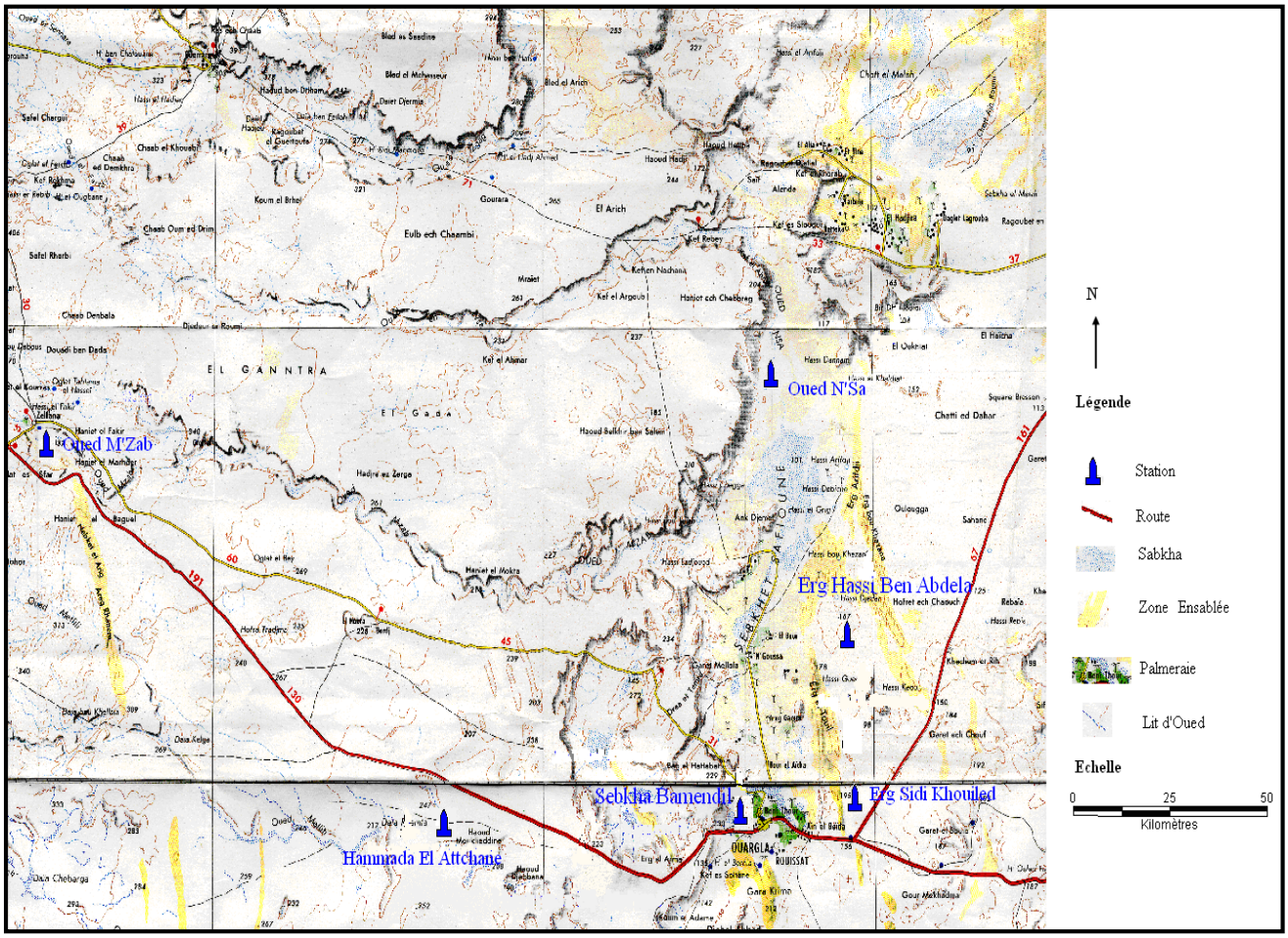

Figure 1. Localization of study in the region of Ouargla and Ghardaia stations. (INCT 1956, modify BAAMEUR, 2012).

profiling. The characterization of soils in biological and physico-chemical terms allowed us to aspects of soil to elucidate the distribution of spontaneous flora in arid environments. Morphological and analytical studies of profiles at each station can give a general idea about the edaphic soil requirements of vegetation in its proper habitat. Six soil sample (0-25 cm) were collected from each site, air dried, thoroughly mixed, and passed through a 2 mm sieve to get rid of gravel. Particle size analysis was carried out using the pipette method, after the destruction of organic matter and the carbonates, and then the particles were dispersed with sodium hexametaphosphate and mechanical agitation (Aubert, 1978), The portion finer than 2 mm was kept for physical and chemical analysis according to Aubert (1978). Electrical conductivity (EC) and soil reaction (pH) were evaluated in 1 :5 soil-water extract using an electric a conductivity meter and a glass electrode pH-metre, respectively. A Bernard calcimetre was used to determine the $CaCo_3$ content, and the atomic - absorption spectrophotometer method for the estimation of the organic matter content. The gypsum was determined according to the method suggested by Coutinet (1965), whose principle is the precipitation of SO^{2-}_4 ions after pretreatment with ammonium carbonates and barium chloride, and the total nitrogen by the Kjeldahl method. This method transforms organic nitrogen into ammonia compounds by concentrated sulfuric acid in the presence of a catalyst. This technique takes place in three stages, the mineralization of organic compounds, distillation and dosage (AFNOR, 1999).

We also prepared a saturation extract from each sample at 25°C to determine its soluble ions (meq/l). Calcium and magnesium were determined by atomic-absorption spectroscopy, and potassium and sodium by flame photometry. The anions were determined by liquid chromatography using DR 2000 equipements. However, the remaining ecological criteria of the stations were slope, altitude, exposure, state of the soil surface and micro-relief.

RESULTS AND DISCUSSION

The identification, classification and the inventory of the spontaneous species of Ouargla and Ghardaia region, using flora Ozenda (1983), have been confirmed in accordance with the Department of Botany of the Graduate School of Agriculture of Algiers. This inventory showed a floristic richness of 56 species belonging to 28 families. It appears that 21 families were represented by only one species (37.5 %) (Table 1). The largest families were Amaranthaceae with 7 species (12.5%), followed by Poaceae, Brassicaceae and Asteraceae (10.71%). However, Zygophyllaceae and Fabaceae represent 5.36%. Euphorbiaceous and Geraniaceae were

Table 1. Distribution of the inventoried spontaneous species according to biotops.

Classes	Families	Species	Biotope									
			Sebkha		Reg		Ham.		Erg		Lit w.	
			V.	A.	V.	A.	V.	A.	V.	A.	V.	A.
Monocotyledons	Poaceae	*Cynodon dactylon*	-	+	-	-	-	-	-	-	-	-
		Danthonia forskahalii	-	-	-	-	-	-	-	-	-	+
		Phragmites communis	+	-	-	-	-	-	-	-	-	-
		Stipagrostis obtusa	-	-	-	+	-	+	-	-	-	+
		Stipagrostis plumosa	-	-	-	-	-	-	-	-	-	+
		Stipagrostis pungens	-	-	+	-	-	-	+	-	+	-
	Liliaceae	*Androcymbium punctatum*	-	-	-	+	-	-	-	-	-	-
	Apocynaceae	*Nerium oleander*	-	-	-	-	-	-	-	-	+	-
	Asclepiadaceae	*Pergularia tomentosa*	-	-	-	-	-	-	-	-	+	-
	Asteraceae	*Bubonium graveolens*	-	-	-	-	-	-	-	-	-	+
		Echinops spinosus	-	-	-	-	-	-	-	-	-	+
		Perralderia coronopifolia	-	-	-	-	-	-	-	-	-	+
		Pulicaria crispa	-	-	-	-	-	-	-	-	+	-
		Rhanterium adpressum	-	-	-	-	-	-	-	-	-	+
		Launaea resedifolia	-	-	-	+	-	-	-	-	-	-
	Brassicaceae	*Farsetia hamiltonii*	-	-	-	-	-	-	-	-	-	+
		Moltkopsis ciliata	-	-	-	+	-	-	-	-	-	-
		Moricandia arvensis	-	-	-	-	-	-	-	-	-	+
		Oudneya africana	-	-	+	-	-	-	-	-	+	-
		Zilla macroptera	-	-	+	-	-	-	-	-	+	-
		Zilla spinosa	-	-	-	-	-	-	-	-	+	-
	Borraginaceae	*Echium pycnanthum*	-	-	-	+	-	-	-	-	-	+
	Capparidaceae	*Cleome amblyocarpa*	-	-	-	-	-	-	-	-	-	+
	Caryophyllaceae	*Paronychia Arabica*	-	-	-	-	-	-	-	-	-	+
Dicotyledons	Amaranthaceae	*Anabasis articulata*	-	-	-	-	-	-	-	-	+	-
		Carduncellus eriocephalus	-	-	-	+	-	-	-	-	-	-
		Cornulaca monacantha	-	-	+	-	-	-	+	-	-	-
		Halocnemum strobilaceum	+	-	-	-	-	-	-	-	-	-
		Salsola vermiculata	-	-	-	-	-	-	-	-	-	+
		Suaeda fruticosa	+	-	-	-	-	-	-	-	-	-
		Traganum nudatum	-	-	-	-	+	-	-	-	-	-
	Cistaceae	*Helianthemum lippii*.	-	-	-	-	-	+	-	-	-	+
	Convolvulaceae	*Convolvulus supinus*	-	-	-	-	-	-	-	-	-	+
	Cucurbitaceae	*Colocynthis vulgaris*	-	-	-	-	-	-	-	-	-	+
	Euphorbiaceae	*Euphorbia guyoniana*	-	-	+	-	-	-	+	-	+	-
		Euphorbia calyptrata	-	-	-	-	-	-	-	-	-	+
	Fabaceae	*Astragalus gombo*	-	-	-	-	-	-	-	-	+	-
		Argyrolobium uniflorum	-	-	-	-	-	-	-	-	-	+
		Retama retam	-	-	+	-	-	-	-	-	-	-
	Frankeniaceae	*Frankenia pluverulenta*	-	-	-	-	-	-	-	-	-	+
	Geraniaceae	*Erodium glaucophyllum*	-	-	-	+	-	+	-	-	-	+
		Monsonia *heliotropioides*	-	-	-	-	-	-	-	-	-	+
	Joncaceae	*Juncus maritimus*	+	-	-	-	-	-	-	-	-	-
	Plantaginaceae	*Plantago ciliata*	-	-	-	+	-	-	-	-	-	+
	Plombaginaceae	*Limonaistrum guyonianum*	-	-	-	-	-	-	-	-	+	-

Ham., Hamada; W, Wadi; V, Vivacious; A, Annual; +, Present; -, Absent.

Table 1. Contd.

Classes	Families	Species	Biotope									
			Sebkha		Reg		Ham.		Erg		Lit w.	
			V.	A.	V.	A.	V.	A.	V.	A.	V.	A.
Dicotyledons	Polygonaceae	*Calligonum comosum*	-	-	+	-	-	-	-	-	+	-
	Resedaceae	*Randonia africana*	-	-	+	-	-	-	+	-	-	-
	Rhamnaceae	*Zizyphus lotus*	-	-	-	-	-	-	-	-	-	-
	Rosaceae	*Neurada procumbens*	-	-	-	-	-	-	-	-	-	-
	Solanaceae	*Datura stramonium*	-	-	-	-	-	-	-	-	-	+
	Tamaricaceae	*Tamarix aphylla*	-	-	-	-	-	-	-	-	-	+
	Thymeliaceae	*Thymelea microphylla*	-	-	-	-	-	-	-	-	-	+
		Fagonia glutinosa	-	-	-	+	-	+	-	-	-	+
	Zygophyllaceae	*Peganum harmala*	-	-	-	-	-	-	-	-	-	+
		Zygophyllum album	+	-	+	-	-	-	+	-	-	-
Saccovulees	Ephedraceae	*Ephedra alata*	-	-	-	-	-	-	-	-	+	-
Total	28	56	6	1	9	10	1	4	6	0	16	23
			7		19		5		6		39	
Frequency		100%	12.5		33.9		8.9		10.7		69.6	

Ham., Hamada; W, Wadi; V, Vivacious; A, Annual; +, Present; -, Absent.

represented by two species per family (3.57%) (Figure 2). OZENDA (1983) noted that Poaceae, Fabaceae and Asteraceae are everywhere dominant families, even in the southern part. Le Houerou (1995) noted 2630 spontaneous species in the arid North African's area; In the Sahara, 1200 species of which only 500 were inventoried by Ozenda (1983) in the Northern Sahara. It should be noted that in the studied area, the natural environment is undergoing degradation due mainly to climate change, overgrazing and poor management of plant genetic resources. Furthermore, for Boumlik (1995) class Saccovulees represented by Ephedra alata is an endangered group.

Concerning the temporal distribution of the spontaneous flora, we distinguish 57.14% were ephemeral and 42.86 % vivacious. The Ephemeral plants, also called "purchases" appear only after the period of rain and execute all their growth cycle before the soil is dry. For Permanent or perennial plants, adaptation puts into Play as-well-as poorly understood physiological phenomena, an assemblage of morphological and anatomical adaptation which mainly give rise to an absorbent system and a reduction in the evaporation surface. The importance of the ephemeral is primarily due to the selected sampling period, which is favourable to their development. However, the unequal distribution between the ephemeral and perennial is also due to the adaptation to drought (Ozenda, 1983). According to UNESCO (1960), herbs appear only for a short period of the year when conditions are favorable, and exhibit permanent morphological changes that enable them to withstand the lack of moisture and long periods of drought.

The different biotopes of the present study, which contain spontaneous species, are classified according to their importance as follows: Wadi beds, Regs, Sebkhas, Ergs and Hamadas (Table 1). These ecologies contain a different floristic richness (Figure 3). The Wadi beds marked by the presence of water contained 39 species which was equivalent to 69.64 % of the total flora in the of different studied biotopes (56 plants)**.** The total richness for the regions Ouargla and Ghardaia was 56 species. 29 species among which 19 are ephemeral and 10 vivacious were located in the Wadi M'zab station. Similarly the maximum values of the average richness with 4.83 species. The total richness of a biocenosis is all the component species (Ramade, 1985). The lowest richness was found in the Hamada el Atchane station with 0.83 (Table 2). Huetz (1970) reported that drought is causing certain poverty in species of spontaneous flora in arid regions, especially in dry areas. Ground cover discontinues because of result either insufficient water in the soil. Low total rainfall prevents water withdrawal by plants in the soil (Mainguet, 1995).

The life-form spectrum of these species was as follows: Chamaephytes are the best-represented species with 22 (39.28%). In the second position came the Therophytes with 19 species (33.92%), the Hemi-cryptophytes (10.71%) and Cryptophyta with six species (10.71%) for each group. Phanerophytes were represented only by three species (5.35%) (Figure 4). The abundance of Théropytes in Wadi M'Zab can be explained by the strong presence of water favourable to the development of annual plants. The different biological forms provide information on growth forms and therefore the response

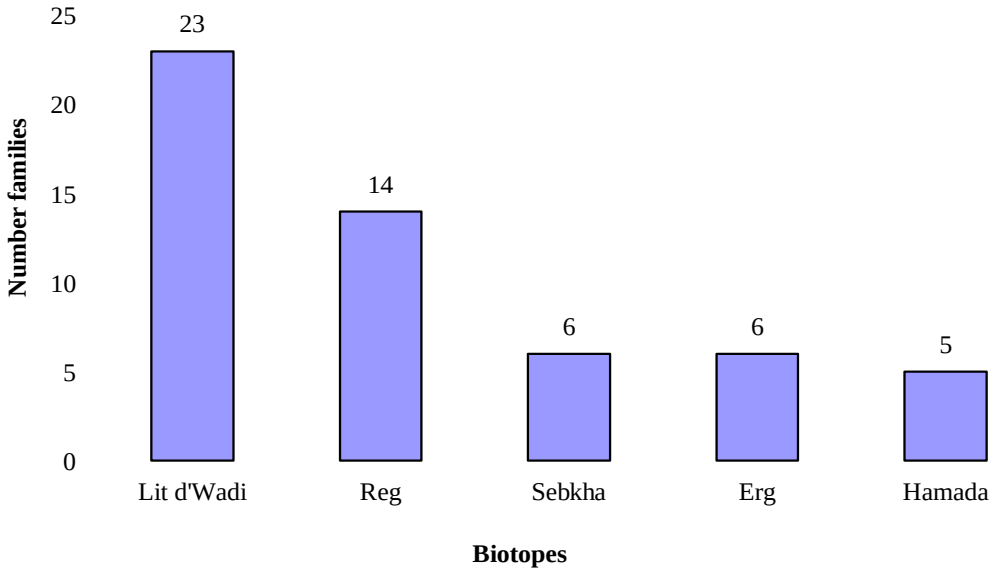

Figure 2. Number of botanical families by biotope.

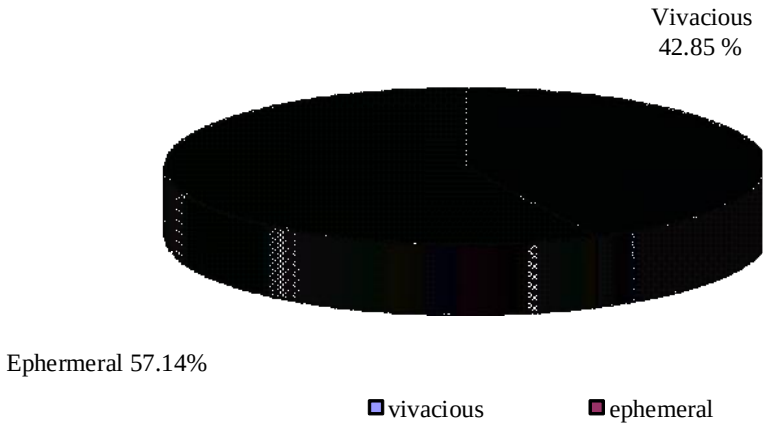

Figure 3. Distribution by category of species in the studied area.

Table 2. Total and average richness of the spontaneous species in the different inventoried sites

Parameter	Sebkha		Reg		Erg		Hamada		Wadi N'Sa		Wadi M'Zab	
	V.	A.	V.	A.	V.	A.	V.	A.	V.	A.	V.	A.
Total richness	6	1	9	10	6	0	1	4	10	10	10	19
	7		19		6		5		20		29	
Average richness	1.16		3.16		1		0.83		3.33		4.83	

V, Vivacious; A, Annual.

of plants to local environmental conditions. The Chamaephytes have a good adaptation to drought (Aidoud, 2005). The same author adds that Therophytes persist while the Hemi- cryptophytes and Phanerophytes increase with rainfall, since this category of plants has low ecological requirements, they colonize various types of environments (Gomaa, 2012). Although the therophytic life form represents the ultimate stage of degradation in xeric habitats, it is often connected to environmental disturbances by grazing (Quezel, 2000). On the scarcity of phanerophytes, Ozenda (1964) reported that the tree layer of the arid zone is very scattered and dispersed in space. And Monod (1973), noted that the characteristic common to all deserts, is the scarcity of trees. This

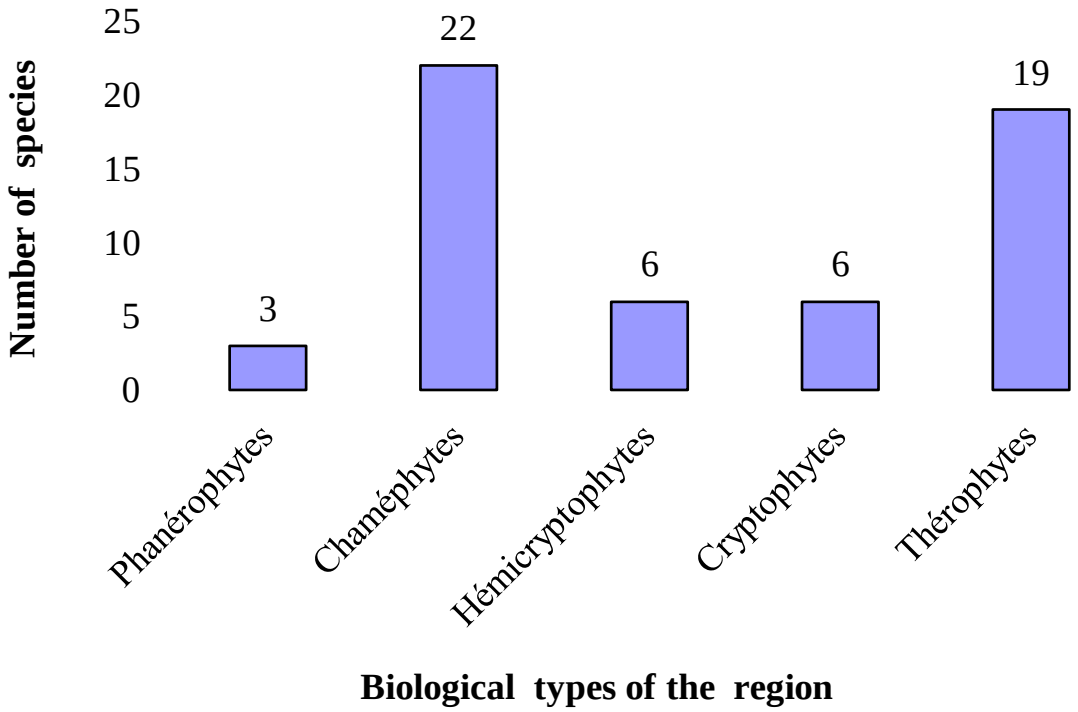

Figure 4. Biological spectrum of spontaneous flora in the studied area.

variation, however, was directly related to the plant cycle and the mode of adaptation of the desert species (Ozenda, 1991), which depends upon the climatic conditions (Gardi, 1973; Poupon, 1980).

The distribution of plant communities has been closely linked to all the physico-chemical characteristics of the soil; these factors appear to play a determing role in the implementation of certain types of plant communities (Lacoste and Salanon, 2001). In the present study the distrIbution of the species according to soil type reveals the presence of four associated sandy groups which are poor in organic matter and whose values ranged from 0.52 to 1.1%. These values reveal a high deficiency in organic matter in soil according to the scale of organic matter defined by Morond (2001), and the nitrogen ranged from 0 to 0.014%. In addition Rouvilois-Brigole (1975) noted that the Ouargla region is characterized by predominantly sandy light soils and particulate structure. It is also characterized by low levels of organic matter, alkaline pH, low biological activity and high salinity (HALILAT, 1993).

The first group represents the Wadi bed and Reg, and is characterized by soil that is endowed by gypsum between 17.3 to 23.3%. In addition the contents of $CaCo_3$ varied from 0.18 to 2.15 revealing that the sampled soils were moderately calcareous, with a notable presence of coarse particles. The Reg of Hassi Ben Abdellah are colonized by the psamophytic species like *Stipagrostis pungens*, *Danthonia forskahalii*, hygrophytic speices such as *Tamarix aphylla*, gypsophytic species like *Oudneya africana* and the Chasmophytic species such as *Zilla spinosa*. Ozenda (1983) indicates that the vegetation in Rreg is loose and poor but well diversified and has high contrast. The Vegetation of the wadi bed of M ‘Zab associated with this soil type is mainly composed of psamophytic speices such as *Stipagrostis pungens*, and gypsophytic speices such as *Randonia africana* but also of halopytic speices such as *Cornulaca monacantha*. Quezel (1965 and 1977) and Teofil Wojterski (1985) notes the presence of 77 species in Wadi M’Zab. Chehma et al. (2005) also demonstrated that the beds of Wadis are the richest and most diverse in species and plant families in the Northern Sahara habitats. Moreover, this area is well known for its richness of medicinal plants (Hadjaidji-Benseghier and Derridj, 2013).

The secend groups, Hamada and the Erg were characterized by soils having relatively neutral pH, whose values varied slightly beteween 7.05 to 7.08 and with average percentage of $CaCo_3$ between 0.67 to 5.23 %, colonized by Traganum nudatum, Stipagrostis obtusa and Fagonia glutinosa, for el Hamada station. These species are already recorded by Ozenda (1983) on the same type of habitat. Similarly Lacoste and Salanon (2001) note that gender Fagonia is particularly characteristic of the vegetation of the northern Sahara Hamada, and psamophytic species like Stipagrostis pungens, Cornulaca monacantha and Euphorbia guyoniana for Erg station . The same species and families obtained are mentioned by Ozenda (1983).

A third group is represented by the Sebkha of Bamendil

Table 3. Soil analysis of the different sites.

Horizons	Settings			Stations studies					
				Seb.	Reg	Erg	Haa.	Wn.	Wm.
Horizon 1	Depth (cm)			0-15	25-Jan	0-15	0-20	0-20	0-25
	Texture			S	S	S	S	S	S
	OM (%)			0.52	1.1	0.17	0.11	0.4	0.6
	Total limestone (%)			10.29	0.18	5.23	0.67	2.8	2.5
	Gypsum (%)			53.28	17.3	35.68	22.27	25.5	23.3
	Total nitrogen (%)			0.007	0.007	0	0.007	0.014	0.014
	$pHe_{1:5}$			6.83	6.81	7.05	7.08	7.08	6.9
	$ECe_{1:5}$ à 25°C (dS/m)			0.56	0.66	0.54	0.1	0.6	3.7
	Ionic balance (cmol / kg)	Anions	Cl^-	1	0.5	0.5	1.5	0.5	5
			SO_4^{--}	2.82	2.56	4.1	1.30	4.53	28.0
			HCO_3^-	0.5	1.5	1	0	0.5	0
			CO_3^{--}	0	0	0	0	0	0
		Cations	Na^+	0.63	0.75	0.84	0.38	0.59	10.46
			K^+	0.15	0.06	0.07	0.03	0.08	0.14
			Mg^{++}	1.5	1.4	1.1	0.2	0.5	6.6
			Ca^{++}	2	1.6	1.4	0.9	2.6	15
			Ca^{++}	0.8	2	0.9	-	13.6	14.5

Haa, Hamada; Wn, Wadi N'sa; Wm, Wadi M'zab; Seb, Sebkha.

whose soil has a sulfated tendency and counterbalanced cationic facies, and whose surface has a magnesium tendency with a conductivity of about 3.74 dS /cm, for Sebkha Hamdi-Aissa and Girard (2000) note that the soil is extremely salty. Reflects its salty aspect by hygrophtic speices such as Phragmites communis, Halocnemum strobilaceum, Sueada fruticosa, Juncus rigidus, and Tamarix aphylla. Khan (1990) indicated that the halophytic and hydro-halophytic plant communities characterize saline habitats, especially in the deserts. And Koull and Chehma (2014) indicated nine perennial species belonging to seven families in the saline wetlands in North East of Algerian Sahara.

Wadi N'Sa station, which forms the fourth group, constituted an intermediate station characterized by a homogeneous ground between the different groups dominated especially by *Ephedra alata*, *Tamarix aphylla* and *Calligonum Comosum* (Table 3). The richness and diversity of beds Wadis beds are mainly due to favourable and soil conditions conducive to the development and maintenance of spontaneous vegetation (Benhouhou et al., 2005). For Djili et al. (2005), there is a relationship between the ecological requirements of the species and medium conditions offered by the stations in the middle region of the Northern Sahara Guerrera East. Plant associations are not distributed randomly and are conditioned by soil, climatic and biotic (Guinochet, 1973). Morphological and analytical study of 6 stations surveyed in the region of Ouargla and Ghardaia, show that they have a texture ranging from sandy to sandy- loam (Table 3) but for Halitim (1980). Over 95% of Algerian arid soils are indeed either limestone or gypsum, or sal - sodium.

Conclusion

The spontaneous vegetation in this arid area, usually adopts a distribution according to edaphisme. No species have a uniform distribution due to the heterogeneity of the environment. Different life forms remain the plant's response to local habitat conditions. It seems that Chamaephytes dominate in dry and moderately humid environments, such as Reg Hassi Ben Abdellah and Wadi N'Sa. On the other hand, in wetlands such as Wadi M'zab, Therophytes dominate. A relationship may exist between a plant and the soil in these regions (Ghardaia and Ouargla) of Northern Sahara Eastern Algeria. Where the water is not a limiting factor, the spontaneous flora is divided into association ranging from Gypso neutrophil - looking for rocky soils to hygro - halophytic vegetation colonizing salty sandy soil. Therefore, this study is a relevant tool in conservation and rehabilitation actions.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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