American Journal of Life Science Researches
2017; 5(3): 102-109
Published online July, 2017 (http://www.diili.org/ojs-2.4.6/index.php/ajlsr/index)
ISSN: 2375-7485 (Print); ISSN: 2332-0206 (Online)

Original Paper

Flora Diversity of Garaet Ouajaa (Wetlands of Guerbes-Senhadja, Northeast Algeria)

Tarek Hamel*, Abderachid Slimani, Ratiba Seridi
Laboratory of Plant Biology and Environment, Badji Mokhtar University Annaba, Algeria
* Corresponding author: Tarek Hamel Email: tarek_hamel@yahoo.fr

ARTICLE INFO
Article history:
Received 22 January 2017
Revised 22 February 2017
Accepted 22 March 2017

Keywords: Flora Diversity, Garaet Ouajaa

The Analysis of the flora diversity of Guaraet Ouajaa between the period 2015 - 2016 revealed the existence of 125 taxa belonging to 48 families and 102 genera. This flora is dominated by therophytes 54%. Of the listed vascular plant species, 32 are of Mediterranean origin. Three endemic taxa have been inventoried, two of which are rare. Urgent protection efforts must be made to conserve this wetland and the species under its control.

INTRODUCTION

Wetlands play important ecological and landscape roles, including flood control, recharge of aquifers, trapping of toxic chemicals, and nutrient recycling [1]. They also constitute remarkable habitats for adapted flora and fauna, contributing strongly to regional biodiversity [2]. The great ecosystem and biological richness of the North of Algeria has recently prompted the proposal to classify the phytogeographic sectors including Kabylie, Numidia (Algeria) and Kroumirie (Tunisia) as a hot spot of biodiversity [3].

This specific richness has long been noticed in the wet complexes of the coastal plains of the regions of El Kala-Edough peninsula-Guerbes-Senhadja. They most probably house the richest hygrophilous and hydrophilic communities in North Africa [4].

This study aims to evaluate the floristic, biological and biogeographic composition of the hydrophytic vegetation one of the Guerbes-Senhadja wetland ponds, "Guareat Ouajaa".

Study Area

Guaraet Ouajaa (36 ° 53'192 "N, 7 ° 18'963" E), a marshy depression, with an area of 20 ha [5]. It is bounded to the north by Guareat Nechmaya, to the south by the commune of Ben Azzouz, to the east by Oued Magroun and by lake Sidi Fritis to the West. It contains an artificial ditch almost always in water and constitutes a reserve for the needs of irrigation and a marshy area with alluvial texture, partially covered with a sandy-peat horizon; It is either submerged or totally dried and placed in culture depending on the alternation of wet or dry years; Its fringes are occupied by damp meadows [6].

Figure 1. Location of study area

METHODS

This inventory was carried out using 10 plant surveys according to the phytosociological method [7]; For two years 2015-2016. The surface of the survey must be at least equal to the minimum area, containing almost all the species present [8]. The control samples are deposited in the herbarium of the Laboratory of Plant Biology and Environment (L.B.V.E) University Badji Mokhtar Annaba, Algeria. The nomenclature of taxa is updated according to recent work [9]. The species listed were informed by their biogeographic type [9, 10, 11], and their biological type according to [8].

RESULTS AND DISCUSSION

The inventory of the Garaet Ouajaa flora revealed the presence of 125 species mainly belonging to Poaceae (16 species), Asteraceae (14 species), Fabaceae (7 species) and Polygonaceae (6 species) (Table 1).

The flora studied is dominated by dicotyledonous angiosperms which form the largest systematic group with 96 taxa belonging to 40 families and 77 genera; The monocotyledons gather 27 taxa distributed in 7 families and 22 genera. Pteridophytes have 2 taxa of the family Isoëtaceae and Salvinaceae.

The species scarcity rate is 10.4%, or 13 species. These rare species are therefore of great value in terms of conservation, either for heritage reasons or for their risk of extinction [13, 14].

Table 1. List of species in the study area

Family	Species	Life Form	Chroptype	Scarcity
Alismataceae	*Alisma lanceolatum With.*	Hydr	Paleotemp	CC
	Baldellia ranunculoides (L.) Parl.	Hydr	Med Atl	AC
Apiaceae	*Ammi majus* L.	Th	Circummed	CC
	Ammi visnaga Lamk	Th	Circummed	CC
	Daucus carota L. subsp. *mauritanicus* (L.) Quézel & Santa	Hem	Med	CC
	Helosciadium nodiflorum (L.) W. D. J. Koch	Hydr	Paleotemp	C
	Oenanthe globulosa L.	Hydr	Med	C
Araceae	*Arum italicum* subsp. *italicum* Miller	Geo	Circummed	C
Asteraceae	*Acanthoxanthium spinosum* (L.) Fourr	Th	Subcosmop	C
	Andryala integrifolia L.	Th	Circummed	C
	Bellis annua subsp. *annua* L.	Th	Med	C
	Bellis repens Lamk.	Hydr	Trop	R
	Centaurea calcitrapa L.	Th	Euro-Med	C
	Cichorium intybus subsp. *glabratum* Arcang.	Hem	Euro-Med	C
	Cladanthus mixtus (L.) *Oberprieler*	Th	Circummed	C
	Conyza canadensis (L.) Cronq.	Th	Intrd	C
	Cotula coronopifolia L.	Th	Intrd	C
	Echinops bovei Boiss.	Th	Ibero-Mag	AC
	Galactites mutabilis Durieu	Hem	End Alg-Tun	C
	Glebiobis segetum (L.) Fourr.	Th	Euro-Med	C
	Senecio vulgaris L.	Th	Subcosmop	C
	Xanthium strumarium L.	Th	Intrd	C
Betulaceae	*Alnus glutinosa* (L.) Gaertn.	Ph	Paleotemp	AR
Boraginaceae	*Echium plantagineum* L.	Th	Med	C
	Heliotropium europaeum L.	Th	Med Atl	C
Brassicaceae	*Biscutella maritima* Ten.	Th	Med	C
	Brassica procumbens (Poiret) O.E. Schulz	Hem	Med	C
	Capsella bursa-pastoris (L.) Medik.	Th	Cosmop	C
	Cardamine hirsuta L.	Th	Subcosmop	C
	Nasturtium officinale R. Br.	Hem	Med	C
	Rorripa amphibia (L.) Bess.	Hydr	Holarc	RR
	Sisymbrium officinale (L.) Scop.	Th	Cosmop	C
Cactaceae	*Opuntia maxima* Miller	Ph	Intrd	C

Callitrichaceae	Callitriche obtusangula Le Gall	Hydr	Med	C
Caryophyllaceae	*Cerastium glomeratum* L.	Th	Holarc	C
	Corrigiola littoralis subsp. *littoralis* L.	Th	Med	C
	Silene colorata Poiret subsp. *colorata*	Th	Med	C
	Silene gallica L.	Th	Subcosmop	C
	Spergula arvensis L.	Th	Cosmop	C
Ceratophyllaceae	*Ceratophyllum demersum* L.	Hydr	Subcosmop	C
Convolvulaceae	*Convolvulus arvensis* L. subsp. *arvensis*	Geo	Med	C
Cyperaceae	*Cyperus longus* subsp. *badius* (Desf.) Asc.	Geo	Paleotemp	C
	Eleocharis palustris (L.) Roem. & Schult.	Hem	Med	C
	Schoenoplectus lacustris (L.) Palla subsp. *lacustris*	Geo	Subcosmop	AC
Euphorbiaceae	*Euphorbia helioscopia* L.	Th	Subcosmop	CC
	Euphorbia terracina L.	Th	Circummed	CC
Fabaceae	*Acacia karroo* Hayne	Ph	Intrd	C
	Lotus corniculatus L. subsp. *preslii* (Ten.) P. Fourn.	Th	Euras	AC
	Medicago littoralis Loisel.	Th	Med	C
	Medicago murex Willd.	Th	Med	C
	Trifolium campestre Schreber	Th	Med Atl	C
	Trifolium glomeratum L.	Th	Med	C
	Trifolium repens L.	Th	Med	C
Gentianaceae	*Centaurium pulchellum* (Swartz) Druce	Th	Med	C
	Centaurium spicatum (L.) Fritsch	Th	Med	AC
Geraniaceae	*Geranium molle* L. subsp. *molle*	Th	Paleotemp	C
	Geranium robertianum subsp. *purpureum* Vi.	Th	Euras	C
Haloragaceae	*Myriophyllum alterniflorum* DC.	Hydr	Med Atl	R
Hypericaceae	*Hypericum pubescens* Boiss.	Hem	Med	AC
Iridaceae	*Iris pseudacorus* L.	Hydr	Euro-Med	C
Isoëtaceae	*Isoëtes histrix* Bory	Hem	Med Atl	C
Juncaceae	*Juncus bufonius* L. subsp. *bufonius*	Hydr	Cosmop	C
	Juncus heterophyllus L.M. Dufour	Hydr	Paleotemp	R
	Juncus tenageia Ehrh. ex. L. f. subsp. *tenageia*	Th	Subcosmop	C
Lamiaceae	*Mentha pulegium* L.	Th	Euras	C
	Mentha suaveolens Ehrh.	Ch	Euro-Med	C
	Stachys arvensis (L.) L.	Th	Med Atl	C
	Teucrium scordium subsp. *scordioides* (Schreber) Arcang.	Hem	Ibero-Mag	AC
Lemnaceae	*Lemna minor* L.	Hydr	Subcosmop	C
Linaceae	*Linum bienne* Miller	Th	Med Atl	CC
Lythraceae	*Lythrum junceum* Banks & Solander	Th	Med Atl	CC

	Lythrum salicaria L.	Geo	Cosmop	C
Menyanthaceae	*Nymphoides peltata* (S.G. Gmel) Kuntze	Hydr	Euras	RRR
Nypheaceae	*Nymphaea alba* L.	Hydr	Euras	RR
Oleaceae	*Fraxinus angustifolia* Vahl.	Ph	Euras	C
Orobanchaceae	*Orobanche minor* Sm.	Th	Med	C
Oxalidaceae	*Oxalis corniculata* L. subsp. *corniculata*	Th	Intrd	C
Plantaginaceae	*Plantago major* L.	Hydr	Med	CC
Poaceae	*Aegilops triuncialis* L.	Th	Circummed	CC
	Agrostis stolonifera L.	Hem	Holarc	AC
	Anthoxanthum odoratum L.	Th	Euro-Med	C
	Arundo donax L.	Hydr	Subcosmop	C
	Avena sterilis L.	Th	Euro-Med	CC
	Briza maxima L.	Th	Med	CC
	Briza minor L.	Th	Med Atl	CC
	Bromus hordeaceus L. subsp. *hordeaceus*	Th	Circummed	C
	Bromus rubens L. subsp. *rubens*	Th	Eurosib	C
	Cynodon dactylon (L.) Pers.	Geo	Cosmop	CC
	Cynosurus polybracteatus Poiret	Th	Euro	C
	Panicum repens L.	Th	Intrd	C
	Phalaris aquatica L.	Hem	Med	C
	Phragmites australis (Cav.) Steud.	Hydr	Subcosmop	C
	Poa annua L. subsp. *annua*	Th	Cosmop	C
	Poa trivialis L.	Th	Euras	C
Polygonaceae	*Persicaria salicifolia* (Willd.) Asenov	Hem	Subcosmop	AC
	Polygonum aviculare L.	Th	Cosmop	CC
	Rumex aristidis Coss.	Ch	End Alg-Tun	R
	Rumex bucephalophorus subsp. *gallicus* Rech.	Hem	Med	CC
	Rumex conglomeratus Murr.	Hem	Euras	C
	Rumex pulcher L.	Hem	Med	CC
Portulacaceae	*Portulaca oleracea* L.	Th	Subcosmop	C
Potamogetonaceae	*Potamogeton trichoides* Cham. & Schltdl.	Hydr	Eurosib	AR
Ranunculaceae	*Ranunculus macrophyllus* Desf.	Geo	Med	C
	Ranunculus muricatus L.	Th	Med Atl	C
	Ranunculus sardous Crant subsp. *sardous*	Th	Med	C
	Ranunculus trichophyllus Chaix	Hydr	Holarc	C
Rosaceae	*Potentilla reptans* L.	Hem	Euras	AC
	Rubus ulmifolius Schott.	Ph	Med	CC
Rubiaceae	*Galium elongatum* C. Presl	Th	Med Atl	C
	Geranium lucidum L.	Hem	Euras	C

	Sherardia arvensis L.	Th	Euro-Med	C
Salicaceae	*Salix alba* L.	Ph	Euras	C
Salvinaceae	*Salvinia natans* (L.) All.	Hydr	Euras	RR
Scrophulariaceae	*Bartsia trixago* L.	Th	Circummed	C
	Linaria pinnifolia (Poiret) Thell.	Th	End Alg-Tun	R
	Linaria reflexa (L.) Chaz.	Th	Med	C
	Verbascum sinuatum L.	Hem	Med	C
	Veronica anagallis-aquatica L. subsp. *aquatica* (Bernh.) Maire	Hydr	Subcosmop	C
	Veronica anagalloides Guss.	Th	Euro-Med	R
Sparganiaceae	*Sparganium erectum* L. subsp. *erectum*	Hem	Holarc	RR
Tamaricaceae	*Tamarix gallica* subsp. *gallica* sensu lato	Ph	Med	C
Typhaceae	*Typha domingensis* (Pers.) Steudel	Hydr	Holarc	CC
Ulmaceae	*Ulmus minor* Miller	Ph	Euro-Med	C
Valerianaceae	*Fedia graciliflora* Fisch. & Meyer	Th	Ibero-Mag	C
Verbenaceae	*Verbena officinalis* L.	Th	Holarc	C

Abbreviation: Paleotempered, Med Atl: Mediterranean Atlantic, Cosmop: Cosmopolitan, Torop: Tropical, Ibero-Mag: Ibero-Maghrebine, End Alg-Tun: Eurosib: Eurosiberian, Euro: European, Hydr: Hydrophyte, Th: Therophytes, Geo: Geophytes, Hem: Hemicryptophytes, Ph: Phanerophytes, Ch: Chamaephytes.

The distribution of the biological types in the plant formation of our study site follows the following diagram: Th> Hydr> Hem> Ph> Geo> Ch (Table 1 and Fig 2). The high frequency of therophytes attests to the disturbance of these environments (clearing, grazing, but also linked to the local climate) [15].

Hydrophytes are well represented in the flora studied (23 taxa, 18.4%). These plants are the most dynamic, but least predictable of all wetland flora [16].

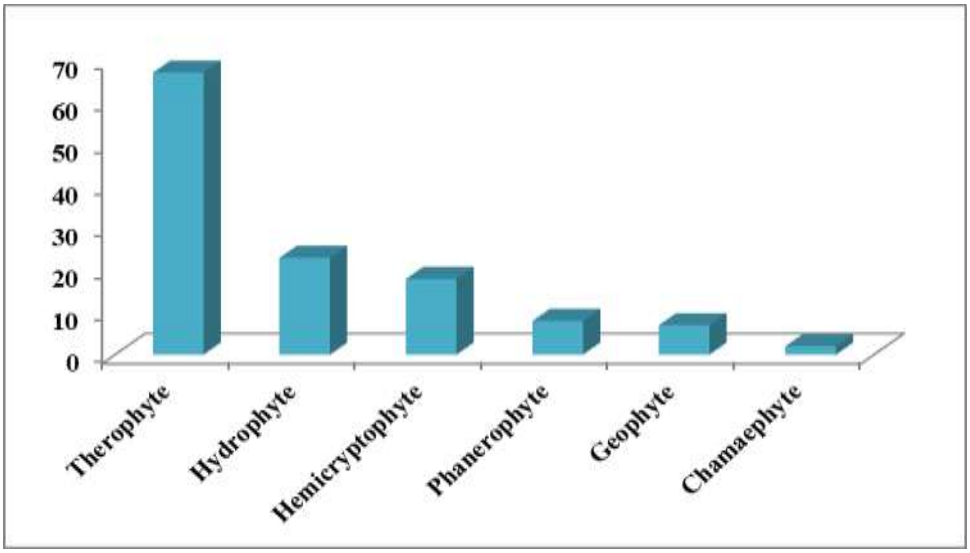

Figure 2. Distribution of biological types in the studied flora

Most species of this group are identified with the strictly Mediterranean chorological element (Circum-Mediterranean) with 40 taxa in approximately 32% (Table 1 and Fig 3). This percentage is slightly higher than that given by [4] on the 26 temporary ponds of Numidia which is 18.2%. The dominance of this element is emphasized by [17] for all the countries of North Africa.

Cosmopolitan species occupy the second place, accounting for about 18% of the total population. These results are comparable to those of [18] in his research on the terrestrial and aquatic vegetation of Djebel Megriss (North Tellien, Algeria).

The interest of this flora lies in the presence of three Algerian-Tunisian endemics (*Rumex aristidis* Coss., *Linaria pinnifolia* (Poiret) Thell., *Galactites mutabilis* Durieu). These rare and rare rarities in Algeria reinforce the interest of the important zone for the plants "Guerbes Senhadja" referenced in North Algeria [19].

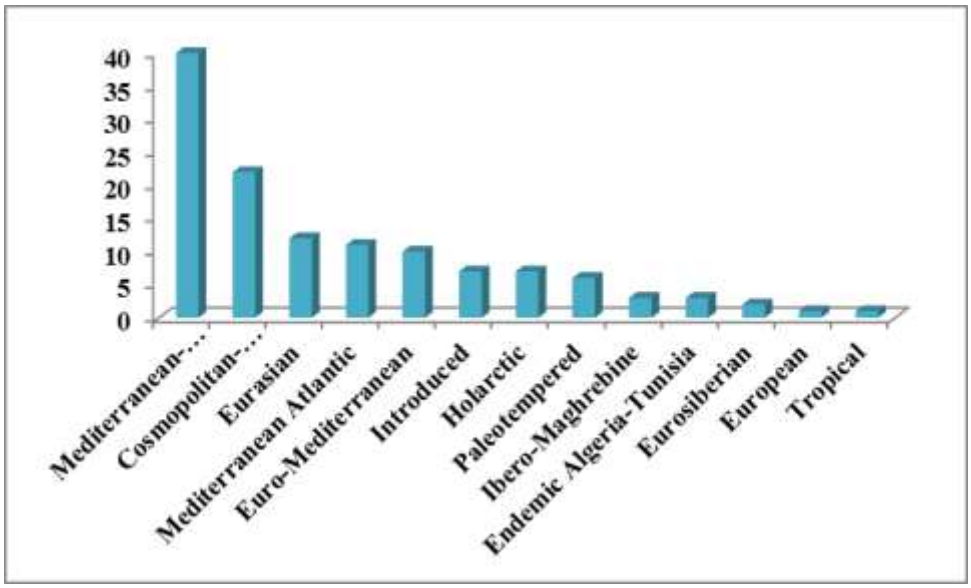

Figure 3. Distribution of chorological types in the studied flora

ACKNOWLEDGMENTS

We would like to thank Gérard de Bélair for his help.

REFERENCES

1. Williams D.D. The Biology of Temporary Waters, Oxford University Press, Oxford, 2006.

2. Oertli B, Indermuehle N, Ange´libert S, Hinden H, Stoll A. Macroinvertebrate assemblages in 25 high alpine ponds of the Swiss National Park (Cirque of Macun) and relation to environmental variables, Hydrobiologia, 2008; 597: 29–41.

3. Véla E, Benhouhou S. Evaluation d'un nouveau point chaud de biodiversité végétale dans le Bassin méditerranéen (Afrique du Nord),ELSEVIER; C.R. Biologies, 2007; 330: 589–605.

4. De Bélair G, Dynamique de la végétation de mares temporaires en Afrique du Nord (Numidie orientale, NE Algérie), Ecol. Mediterranea. 2005; 31: 83–100.

5. Samraoui B, de Bélair G. The Guerbes-Senhadja wetlands: part 1. An overview. Ecologie. 1997; 28: 233-250.

6. De Bélair G, Véla E. Découverte de *Nymphoides peltata* (Gmel) O. Kuntze (*Menyanthaceae*) en Afrique du Nord (Algérie). Poiretia, 2011; 3 : 1-7.
7. Braun-Blanquet J. Pflanzensoziologie grundzuge der vegetation kunde. Springer. Vienne. Ed. 2 Autriche. 1951.
8. Guinochet M. Phytosociologie. Paris, Ed. Masson et Cie. 1973.
9. Dobignard A, Chatelain C. Index synonymique et bibliographique de la flore d'Afrique du Nord. Vol. 1 à 4, *5 in préparation.* C.J.B.G, Genève. 2010-2013.
10. Pignatti S. Flora d'Italia. Edagricole, Bologna (IT), 3Vols. 1982 reprint 1997.
11. Blanca G, Cabezudo B, Cueto M, Lopez C.F, Torres C.M. Flora Vasculair de Andalucía Oriental. Vol. 1 à 4. Consejería de Medio Ambiente. Junta de Andalucía. 2009.
12. Raunkiaer C, The life forms of plants and statistical plant. Geography. Claredon press. Oxford. 1934.
13. Pimm S.L, Jones H.L, Diamond J. On the risk of extinction, *The American Naturalist*, 1988; 132: 757-785.
14. Gaston K.J, How large is species geographical range? *Oikos*, 1991; 61: 434-438.
15. Yahi N, Djellouli Y, de Foucault B. Diversités floristique et biogéographique des cédraies d'Algérie. Acta Bot. Gallica, 2008, 155 (3): 389-402.
16. Pearce F, Crivelli A.J. Caractéristiques générales des zones humides méditerranéennes. Conserv. Des zones humides médit. *Medwest*. Tour du Valat. Arles. 1994.
17. Quézel P, *Réflexions sur l'évolution de la flore et de la végétation au Maghreb méditerranéen.* Ibis Press, Paris, 2002.
18. Boulachaab N. Etude de la végétation terrestre et aquatique du djebel Megriss (Nord Tellien, Algérie) Analyse floristique, phytosociologique et pastorale, Thèse de Doctorat, Université Ferhat ABBAS, Sétif, (Algérie), 2009.
19. Yahi N,Véla E, Benhouhou S, De Bélair G, Gharzouli R. Identifying Important Plants Areas (Key Biodiversity Areas for Plants) in northern Algeria. Journal of Threatned Taxa, 2012; 4 (8): 2753-2765.