Research Article

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PTERIDOPHYTES OF EDOUGH PENINSULA (NORTH-EAST ALGERIAN)

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ABSTRACT

This study is a contribution to update the list of pteridophyte flora of Edough Peninsula in the North-East of Algeria. The inventory of the species has carried out during seven consecutive seasons from 2010 to 2016. The investigation was taking place in several stations characterized by different ecological features. The results of the survey have revealed the occurrence of 22 taxa belonging to 13 families and 15 genera. The studied flora was characterized by subcosmopolitan origins (27.27%), with a predominance of hemipterophytes rosales (59.1%). A significant number of rare taxa were inventoried: 4 rare taxa and 4 quite rare taxa. The floristic diversity of the study area should preserve its wilderness character.

Key words: Pteridophytes, Edough peninsula (North-East Algeria), Subcosmopolitan, Hemipterophytes rosales, preserve.

INTRODUCTION

The Mediterranean region is a real puzzle, both by its extremely fragmented and heterogeneous model, and its geology which is certainly one of the most complexes in the world¹.

The great ecosystem and biological richness of Northern Algeria has recently received the proposal to classify phyto sectors including Kabylia, Numidia (Algeria) and Kroumirie (Tunisia) as biodiversity hotspots². This area corresponds in fact to the definition of Hotspots³ bringing both the species richness, endemism rate⁴ and increasing anthropogenic threats⁵.

Pteridophytes found in the Mediterranean region include a hundred species⁶ of which nearly sixty is present in Algeria^{7, 8}. These species live in soils rich in humus; some are calcareous (*Scolopendrium*, *Adiantum*), other siliceous (*Pteridium aquilinum*), some species are aquatic, swimming freely (*Salvinia*) while others are amphibious (*Isoetes*, *Marsilea*)⁹.

Botanical explorations and recent publications on the vascular vegetation of the Edough Peninsula (North East of Algeria) are few, both from a chronological inventories perspective in ¹⁰⁻¹³.

In this regard, this contribution is to provide new items to a pteridophytes catalog of the Edough Peninsula.

MATERIALS AND METHODS

The study area, covering a surface of 47350 hectares, is limited by the Mediterranean Sea in the North -east and North -west, by the Lake Fetzara basin in the South, by the lower course of the river El Kebir in the West, and by the plain (lowland) of Kherraza in the East¹⁴ (Figure 1).

The sea invasion of this area in the Pliocene has transformed the Edough Peninsula into an island¹⁵. But the sedimentary supplies

from the hinterland caused the progressive filling of the southern and eastern areas of the Edough, which has thus found itself, attached to the mainland from the lower Quaternary, hence the geographical situation of this region today¹⁶.

The inventory (census) of species was carried out in the years of 2010-2016. The data information of this work is presented in the following order:

The scientific name: our identification and classification of the Pteridophytes species is based on^{7, 8, 17}. The new classification was updated for the species surveyed in the light of recent work compiled in the synonymous and bibliographic index of the North African flora¹⁸.

Biological types: Cr. Ch. (Crawling Chamephyte), Hem. ros. (Hemipterophyte rosale), Hem. Rhiz. (Rhizomatous Hemipterophyte), Cr. Hem. (Crawling Hemipterophyte), Ces. Hem. (Cespitose Hemipterophyte), Rhiz. Geo. (Rhizomatous Geophyte), Th. ros. (Therophyte rosales)^{19, 20}.

Geographical distribution: For each taxon the biogeographical distribution in Algeria is indicated for the divisions adopted by⁸: Great Kabylie. K2: Small Kabylie. K3: Numidia. C1: Tell of Constantine. A1: Coast of Algiers. A2: The Tell Atlas of Algiers. O1: sahels of Oran coasts. O2: Oran coastal plains. O3: The Tell Atlas of Oran. H1: Algiers and Oran Highlands. H2: Constantine Highlands. Hd: Hodna. AS: Saharian Atlas of Oran. AS2: Saharian Atlas of Algiers. AS3: Saharian Atlas of Constantine.

Abundance appreciation: We used⁸ scale of rarity of the flora: R: rare; QR: quite rare; QC: quite common; C: common; VC: very common.

Biogeographical types: the identified species were indicated by their biogeographical kind^{20, 21}.

Figure 1: Location of the study area

RESULTS

The number of Pteridophyte species identified in the Edough Peninsula is 22, belonging to 13 families and 15 genera. The family of Asplenaceae was the most represented with 9 taxa, the rest were bispecific and sometimes even monospecific.

Figure 2: *Asplenium obovatum* subsp. *obovatum* Viv.

Figure 3: *Phyllitis sagittata* (DC.) Guinea & Heywood

Figure 4: *Phyllitis scolopendrium* (L.) Newman

Figure 5: *Osmunda regalis* L.

Figure 6 : *Cystopteris diaphana* auct. non Bory

Figure 7 : *Cystopteris fragilis* subsp. *fragilis* (L.) Bernh.

Table 1: List of taxa rested in the study area

Family	Taxa	Synonymous	Biological types	Biogeographical types	Geographical distribution	Ab app	Habitat in the study area
Adiantaceae	<i>Adiantum capillus-veneris</i> L.		Rhiz. Hem	Subcosmopolitan	K1-2-3, C1, A1-2, O1-2-3, AS1-2-3	QC	Wet caves, banks of rivers and springs
Asplenaceae	<i>Asplenium adiantum-nigrum</i> L.	<i>A. adiantum-nigrum</i> L. subsp. <i>nigrum</i> Heufler	Hem. ros.	Euro - Mediterranean	K1-2-3, C1, A1-2, O1-2-3 and AS1-2-3	C	Taxon very widespread in the study area including stony grounds
	<i>Asplenium billotii</i> F. W. Schultz	<i>A. obovatum</i> Viv var. <i>typicum</i> (Luerssen) Maire	Hem. ros.	Euro - Mediterranean	Not available	QR	Cracks of the shaded mountain rocks
	<i>Asplenium obovatum</i> Viv. subsp. <i>obovatum</i>		Rhiz. Hem	Mediterranean Atlantic	K1-2-3, C1, A2, O1	QR	Cracks of fresh rocks especially the coastal (Figure 2)
	<i>Asplenium onopteris</i> L.	<i>A. adiantum-nigrum</i> L. subsp. <i>onopteris</i> (L.) Heufler	Hem. ros.	Euro - Mediterranean	K1-2-3, C1, A1-2, O1-2-3, AS1-2-3	C	Wet rocks, bushes and mountain forests
	<i>Asplenium trichomanes</i> L. subsp. <i>quadrivalens</i> D. E. Meyer		Hem. ros.	Circumboreal	K1-2-3, C1, A-1-2, O1-2-3, AS-1-2-3	C	Brushwood and cracks of the shaded mountain rocks
	<i>Athyrium filix-femina</i> (L.) Roth.		Hem. ros.	Holarctic	K1-2-3, A2	QR	Damp water edges and ravines
	<i>Ceterach officinarum</i> subsp. <i>officinarum</i> Will.	<i>Asplenium ceterach</i> L.	Hem. ros.	Eurasien circummediterranean	K1-2-3, C1, A2	C	Old walls and dry mountain rocks
	<i>Phyllitis sagittata</i> (DC.) Guinea & Heywood	<i>P. hemionitis</i> (Lag.) O. Kuntze = <i>Scolopendrium hemionitis</i> Lag = <i>Asplenium sagittatum</i> (DC.) Bange	Hem. ros.	Mediterranean	K1-2-3, A1, O3	QR	Limestone damp rocks of Cap de Garde (Figure 3)
	<i>Phyllitis scolopendrium</i> (L.) Newman	<i>Asplenium scolopendrium</i> L.	Hem. ros.	Mediterranean Eurosiberian	K1-2-3, C1, A2	QC	Shadowy river banks and ravines (Figure 4)
Dryopteridaceae	<i>Polystichum setiferum</i> (Forsskål) Woyнар	<i>Dryopteris aculeata</i> (L.) Kuntze subsp. <i>aculeata</i> sensu auct. and Maire, non L. = <i>Aspidium aculeatum</i> sensu Swartz	Hem. ros.	Mediterranean Atlantic	Not available	R	Water edges and shadowy mountain areas
Equisetaceae	<i>Equisetum ramosissimum</i> Desf. subsp. <i>ramosissimum</i>	<i>E. ramosum</i> DC ; = <i>E. campanulatum</i> Poiret	Ces. Hem.	Subcosmopolitan	K1-2-3, C1, A1-2, O1-2-3, H1-2, Hd, AS1-2-3	CC	Crop fields and banks of streams
	<i>Equisetum telmateia</i> Ehrh	<i>E. maximum</i> auct. non Lam.	Ces. Hem.	Holarctic	K1-2-3, C1, A1	QC	Crop fields and damp mountain areas
Hemionitidaceae	<i>Anogramma leptophylla</i> (L.) Link	<i>Gymnogramma leptophylla</i> (L.) Desv.	Th. ros.	Subcosmopolitan	K1-2-3, C1, A1-2, O1-2-3	C	Fresh brush and forests, old walls and rock cracks
Hypolepidaceae	<i>Pteridium aquilinum</i> (L.) Kuhn	<i>Pteris aquilina</i> L.	Rhiz. Geo.	Subcosmopolitan	K1-2-3, C1, A1-2, O1-2-3	C	The habitat of this species is very varied. It is common in alders; it occupies the undergrowth of zénaie and the wet cork oak forest
Isoëtaceae	<i>Isoëtes histrix</i> Bory		Hem. ros.	Mediterranean Atlantic	K1-2-3, C1, A1-2, O1-2-3	QC	Edges of small temporary acidophilus ponds, wet winter pastures
Ophioglossaceae	<i>Ophioglossum lusitanicum</i> L.		Rhiz. Geo.	Mediterranean	K1-2-3, C1, A1-2, O1-2-3	R	The first resort already known as the oleo-mastic group is in Cape de Garde, and another one was reported in 2013 in a clear cork oak forests in Kef ejmal (Ain Barbar).
Osmundaceae	<i>Osmunda regalis</i> L.		Hem. ros.	Subcosmopolitan	K1-2-3	C	This species is subservient to moist and shady mountain areas. It is often under the feet of the <i>Alnus glutinosa</i> (L.) Gaertner (Figure 5)
Polypodiaceae	<i>Polypodium cambricum</i> L. subsp. <i>cambricum</i>		Cr. Hem.	Mediterranean Atlantic	K1-2-3, C1 A1-2, O1-2-3	VC	Epiphytes or rupicoles living on shady rocks and ravines
Selaginellaceae	<i>Selaginella denticulata</i> (L.) Spring		Cr. Ch.	Mediterranean	K1-2-3, C1, A1-2, O1-2-3	VC	Very common in forests and wet pastures
Woodwardiaceae	<i>Cystopteris diaphana</i> auct. non Bory	<i>C. filix-fragilis</i> (L.) Borbas subsp. <i>diaphana</i> (Bory) Litard.	Hem. ros.	Subtropical	Not available	R	Riverbanks and cracks of wet mountain rocks (Figure 6)
	<i>Cystopteris fragilis</i> subsp. (L.) Bernh. <i>fragilis</i>		Hem. ros.	Subcosmopolitan	K1-2-3, C1, A2, AS3	R	Cracks of fresh siliceous rocks (Figure 7)

Ab app: Abundance appreciation

DISCUSSION

The Numidia K3 sector (as defined in the subdivision proposed by⁸) contains 28 species of ferns^{7, 8, 22}, in this work we have identified ¾ ferns observed in this sector. Indeed, the pteridophytes are depending upon the microclimatic conditions of the region for their successful survival in that region²³.

The number of rare Pteridophytes consist of 8 taxa including 4 quite rare species, and 4 rare species. These rare species are generally considered to have low abundance and / or a restricted range. The specific habitat, taxonomic originality and temporal persistence of species are also useful criteria in the definition of scarcity¹.

In Algeria^{24, 25} have drawn attention to the rarefaction or disappearance of a dozen species of ferns following the destruction of its habitats. Thereupon, the rare specimens of *Woodwardia radicans* (L.) Sm. are reported in moist, shady ravines in the forests of low siliceous mountains, well-watered to 500m^{7, 8}. We could not see the station. But the species probably keep the same status?

The study of life forms shows a predominance of Hemicryptophyte rosales (59.1%), that is to say 13 taxa, followed by rhizomatous, caespitose Hemicryptophyte, and rhizomatous Geophytes with (9.1%) for each type. These results are comparable to those of ²⁶, in his researches on the Pteridophytes of the Tlemcen region (Algerian Northwest).

Chronologically, the subcosmopolitan element dominates with 6 species (27.27%), followed by the Mediterranean-Atlantic element with 4 species (18.18%) and the Euro-Mediterranean element with 3 species (13.63%). The rest is a low turnout, but contributes to the diversity of the flora studied. This heterogeneity of biogeographical types of the study area responds to the extreme paleogeographic and paleoclimatic complexity of the Mediterranean region²⁷.

CONCLUSION

The study area includes 22 species of Pteridophytes. This obvious richness is determined by:

- The bio-geographical situation of the site, at the crossroads of several bio-climatic influences (biogeographic transition zone).
- Fluctuations contrasting local ecological conditions.

This flora (Pteridophytes) of the Algerian phytogeographic domain is characterized by the predominance of the family Asplaneaceae with 9 taxa, (40.9%). A very high rate of Hemicryptophytes rosales and the important elements with subcosmopolitan origins (27.27% of the total flora). Due to different climatic conditions, The extreme diversity has observed, different plant groups present on siliceous, calcareous and clayey soils, in dry or wet conditions, this create a strong heterogeneity responsible for the richness of the pteridophytes of the region.

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