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Diversity of Stream Vegetation in Oum El Bouaghi Region (East of Algeria)

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ABSTRACT

A recent floral study includes an inventory and analysis of floral biodiversity in five wadis in Oum El Bouaghi region. A floristic inventory spread over a period of one year (2015 to 2016). This study conducted to identify 80 species belonging to 28 families, the family best represented is Asteraceae with (47%), and the most diverse sites are wadi Meskiana and wadi Dahmane with 57 and 34 species, respectively. Species indicative of environmental disturbance or soil degradation and drought have been identified. For the distribution and the floristic diversity, several factors are motioned, such as the aridity of the climate of the studied environment, the drought and the anthropic pollution of these rivers. A local flora database has been updated.

Keywords: *Asteraceae, Therophytes, Wadis, Inventory, Oum El Bouaghi.*

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1. INTRODUCTION

Algeria has a great diversity of natural wetlands. This diversity results from plant formations that are particularly varied in terms of their structures and physiognomy, as well as the richness of their forests procession (Dahalli, 2017).

The regions have a Mediterranean-type climate and are home to particularly rich and diverse wetlands (Deil, 2005). This is particularly the case for rivers which are among the most complex and dynamic ecosystems. They play a key role in the conservation of biodiversity, in the functioning of organisms and in the cycle of organic matter, despite their exceptional biological richness, which has been recognized for a long time (Medail et al., 1998; Gauthier et al., 2004). These environments have so far been little studied and have not been subject to conservation measures. They show a loss of diversity under the influence of various anthropogenic pressures (pumping, drainage, overgrazing, pollution, cultivation, etc.) (Samraoui et al., 1992; De Belair, 2005).

These rivers are very productive; they form valuable reservoirs of biological diversity and provide many hydro-biological functions.

The vegetation cover is one of the main components. It plays a fundamental role in the structure and functioning of these ecosystems, of which it is an expression of the biological potential. Spontaneous plants growing on the banks of watercourses adapt to the conditions of semi-arid environments. In Algeria, arid and semi-arid environments offer opportunities for the evaluation and understanding of the mechanisms involved in the diversification and adaptation of plants in relation to the evolution of their environment (Amirouche and Misset, 2009).

The position of each plant depends on a set of ecological factors such as climate and soil type that directly affect the distribution of plant species (Medjber, 2014).

In Algeria, the most recent ecological studies in Phyto-ecology have focused on wet complexes located on the coast. Our study of stream vegetation in the region of Oum El-Bouaghi (East-Algeria) remains a pioneer. Its objectives are: the evaluation of the specific and Phyto-sociological wealth, determination of the composition and structure of the vegetation and the establishment of a list of plant species on our site.

2. MATERIALS AND METHODS

Study area and data collection

The vegetation inventory of the banks of the 5 rivers was conducted in the wilaya of Oum El Bouaghi on the 5 sites (each site has 3 stations and each station includes 3 surveys): Wadi Meskiana, Wadi Dahman, Wadi D'himine, Wadi Guerrah and Wadi Sigus. The climate is continental, semi-arid with a winter often very cold and rainy and a summer hot and dry. The average annual rainfall varies between 350 and 500mm (A.N.D.I, 2013). Irregular rainfall and poor distribution, high temperatures give rise to periods of summer drought spanning a period of 5 months. These disturbances negatively affect rangeland vegetation (El Moudden, 2004) (Table 1) (Figure 1).

Wadi Meskiana

The sub-basin of Wadi Meskiana covers an area of 1680 km^2; it is located in north-eastern Algeria. It is located halfway between the Mediterranean and the Algerian Sahara and is part of the Medjerda-Mellègue Basin. Several agglomerations sit there: Bellala, Dhalaa, Meskiana, Rehia and Zebar (ABH-CSM, 2005).

Wadi D'himine

It covers an area of approximately 3000 ha. It is located 3 km north of Ain Babouche and whose geographical coordinates are the following: 35 ° 58'37,64 '' North in 36 ° 01'09,78''Nord and 7 ° 11'22,80 '' East at 7 ° 14'38,38''Est (Merouane, 2014). The village of Ain Babouche is located 90 km south-east of Constantine and 11 km north of Oum El Bouaghi.

Wadi Dahmane

This wadi represented part of Wadi Settara, its average depth varies between 0.5 and 3.5 m. Its water is sweet in nature. In recent years of drought, the wadi is threatened by the installation of numerous water pumps used for irrigation of cereal crops (Merouane, 2014).

Wadi El Gerrah

The upstream of this wadi, is located in the municipality of Ain M'Lila from the road Ouled Guecem, through El-Roknia to the limits of the wilaya of Oum El Bouaghi with Constantine. El-Guerrah (El Gourzi) is a city that is part of the wilaya of Constantine. It is part of the Bomerzoug watershed.

Wadi Sigus

The wadi Sigus watershed includes the basin of Bir Tanja: The wastewater is discharged by networks to a specific channel in the center of the municipality; this region presents a risk of flooding. And Thlath Hamri Basin; Wastewater is discharged directly without primary treatment through a canal.

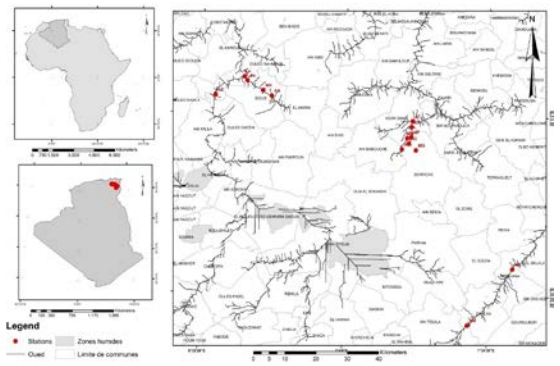

Figure 1. Geographical location of the 05 sampled stations

Table 1. Geographic coordinates of sampling sites

	Upland zone	Riparian zone	Aquatic zone
Wadi Meskiana	35°28.6260'N 7°30.4500'E	35°38.2800'N 7°39.8460'E	35°45.5940'N 7°47.1900'E
Wadi Dahman	35°58.3996'N 7°16.0317'E	36°00.2964'N 7°17.1619'E	36°03.2092'N 7°18.2396'E
Wadi D'himine	35°59.3989'N 7°17.5011'E	36°00.4988'N 7°18.0043'E	36°02.1533'N 7°18.0216'E
Wadi Guerrah	36°07.0741'N 6°36.1930'E	36°09.1433'N 6°36.1930'E	36°10.2657'N 6°42.2900'E
Wadi Sigus	36°09.619'N 6°42.931'E	36° 07.981'N 6°46.319'E	36° 07.085'N 6° 48.178'E

3. RESULTS

Wadi Meskiana

Diversity of families inventoried in wadi Meskiana is 21 families including 57 species. The Asteraceae family is the most abundant with 18 species (31.58%), followed by the Brassicaceae family (8.5%) with 5 species. A dozen families are represented by only1species (1.75%) (Figure 2 and 3).

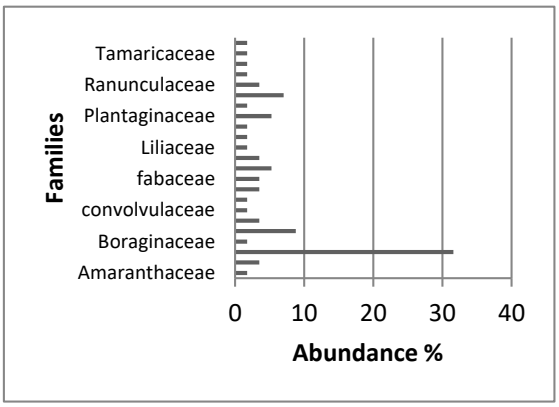

Figure 2. Relative abundance of families at the three stations of the Wadi meskiana

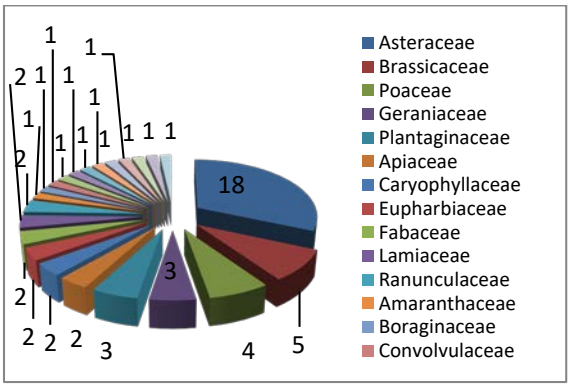

Figure 3. Number of species for each floristic family at the three stations of the Wadi meskiana

Wadi Dahmane

The floral procession of this site includes 17 families and 34 species. The Asteraceae family is the most dominant with 7 species (20.59%) followed by the Fabaceae family with 4 species (11.76%). About ten families are represented by only one species (2.94%) (Figure 4 and 5).

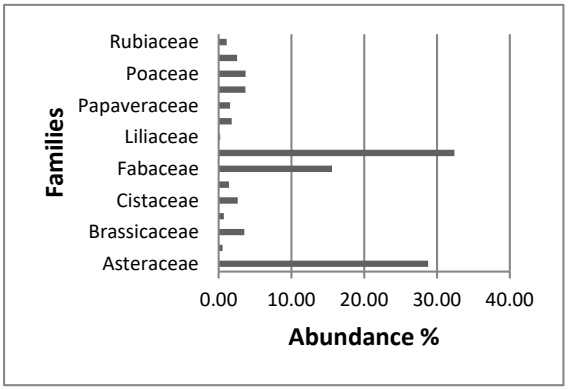

Figure 4. Relative abundance of families at the three stations of the wadi Dahmane

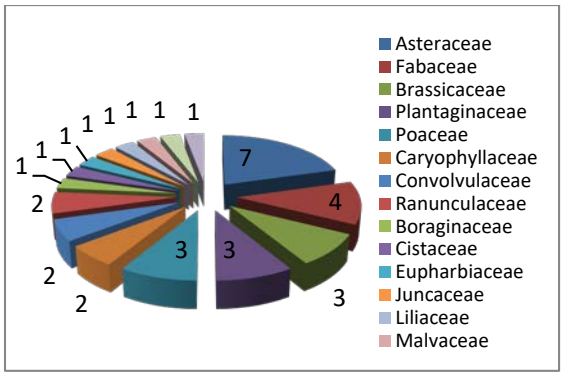

Figure 5. Number of species for each floristic family at the three stations of the wadi Dahmane

Wadi D'himine

The results in (Figure 6 and 7) from wadi D'himine explain a wealth of 24 species, corresponding to 10 families. The Asteraceae family is the most dominant with (38.73%) 9 species, followed by the brassicaceae with (16.06%) and 4th species, the Poaceae are represented with 3 species and 10.70%, the rest of the families count only one species.

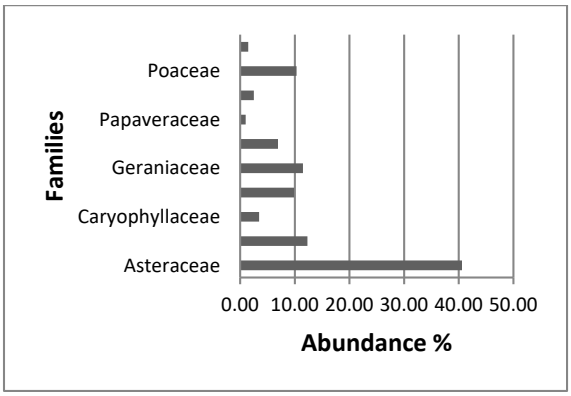

Figure 6. Relative abundance of families at the three stations of the wadi D'himine

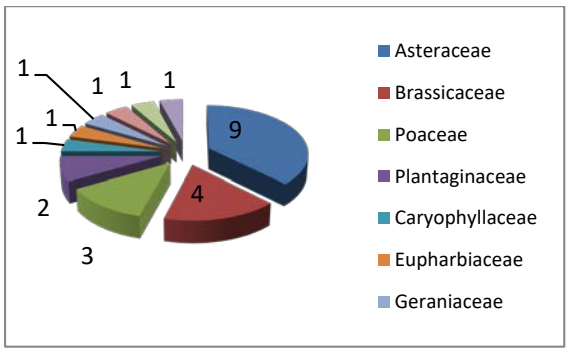

Figure 7. Number of species for each floristic family at the three stations of the wadi D'himine

Wadi Elgerrah

This site is composed of 19 species belonging to 9 families among which the family Malvaceaes is the most abundant with 51.22% and 9 species followed by plantaginaceae with 28.7% including 3 species and Brasicaceaes with 9.71% and 3 species, the remainder of the families are represented by a single species (Figure 8 and 9).

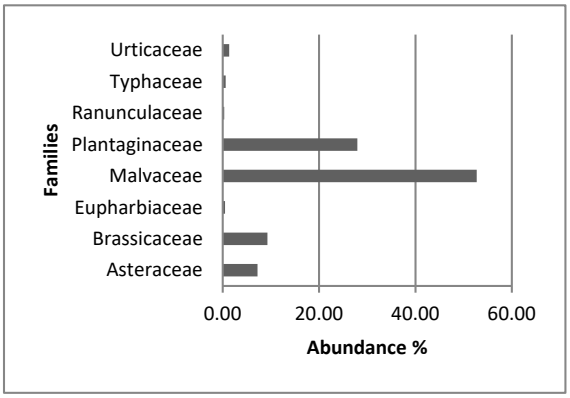

Figure 8. Relative abundance of families at the three stations of wadi Elgerrah

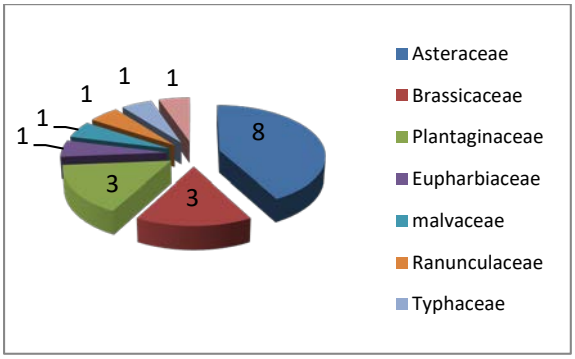

Figure 9. Number of species for each floristic family at the three stations of wadi Elgerrah

Wadi Sigus

The floral composition in the three stations of this river and present in Figure 10 and 11, out of a total of 15 families, the Asteraceaes family is the most dominant with 50% and 7 species, followed by the Euphorbiaceaes with 12.30% and 3 species, the Brassicaceae, Poaceae and Ranunculaceae families are present with 10% and only one species.

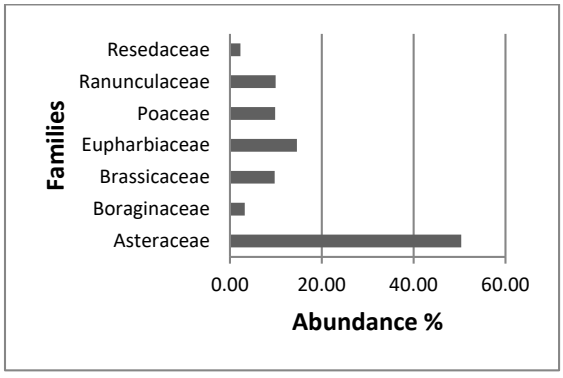

Figure 10. Relative abundance of families at the three stations of Wadi Sigu

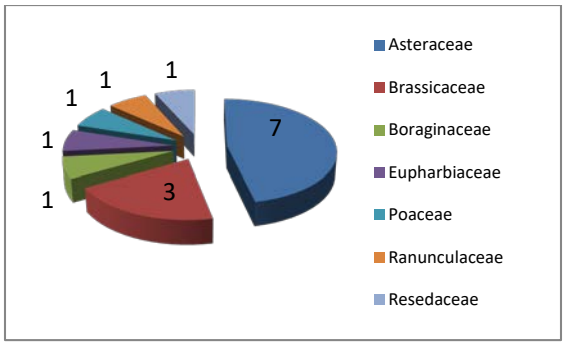

Figure 11. Number of species for each floristic family at the three stations of wadi Sigu

Biological types

The most used classification for the definition of biological types is that of Raunkiaer (1918), the following fourth biological types: Geophytes, Therophytes, Hemicryptophytes and Nanophanerophytes. Analysis of the vegetation in the study areas shows that Therophytes are the most dominant in the counterbution of plant cover (61.96%), followed by Hemicryptophytes with (22.91%), with a small percentage we find Nanophanerophytes and Geophytes with 8.37% and 6.74%, respectively.

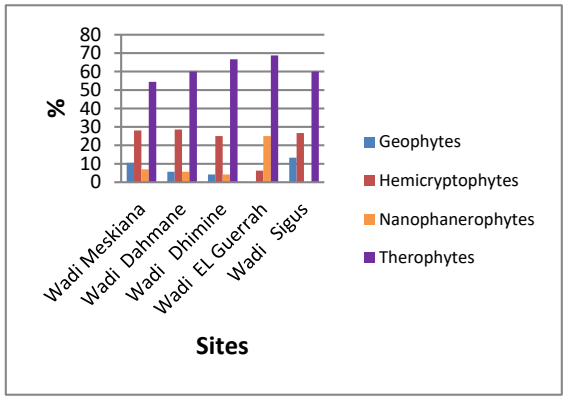

Figure 12: The biological types of each site studied

4. DISCUSSION

The recent work is carried out on 5 rivers in the region of Oum El Bouaghi in the north-east of Algeria. The vegetation of these rivers is systematically sampled where representative samples of each species are collected during the flowering period (from March to May 2016) to facilitate plant identification. The floral inventory includes 80 plant species belonging to 28 different botanical families of vascular plants (phanerogams). This inventory reflects a rich diversity, and has contrasting results that is already known for arid regions (Ozenda, 1983). The Asteraceae family includes the highest number of species which was recorded as 47% and 24 species. The two sites "wadi Meskiana and wadi Dahmane" are the most diverse with 57 and 37 species, respectively.

Daget, (1980) saying: "In fact, theropytia constitutes the most constraining life imperative: massive germination and fructification, rapid growth, on a soil capable of preserving seeds". Among the most dominant therophytic plants listed: Adonis aestivalis, Euphorbia helioscorpia, Galactite tomentosa, Hordeum murinum, Malva sylvestris, Martricaria maritima (Arabi, 2016).

In second position are the Hemicryptophytes which characterize soils poor in organic matter (Barbero et al., 1989), the species which group this biological type and the most represented in our studied sites are: Brassica nigra, Centaurea calcitrapa, Plantago lenceolata.

The lack of light reduces the herbaceous stratum in the composition and still clouded by overgrazing, Nanophanerophytes occupies the third position, are rarefied, create over time vast clearings with short grass (Gustave., 1929), plants belong to this types are...: Artimisi acina, Marrubium alyson, Phragmite australis, Geranium robertianum, Urtica diouca, Salvia verbenaca.

The last place is for Geophytes, which are perennial plants, which have organs allowing them to spend the bad season buried in the soil Raunkiaer (1918), among the species invented on sites: Taraxum densleonis, Peganum harmala, Resedalutea, Filagoarvensis, this type is reported to regress and disappear in lawns and steppe areas (Barbero et al., 1989; Arabi., 2016).

According to Dakki and El Hamzaoui (1998) we have made to very interesting and very sensitive environments on the biodiversity and environmental level.

Our results show the state of degradation that the study region is experiencing, they are summarized in the following points:

Degradation of the vegetation covers by the appearance of indicator species such as Peganum harmala and Malva sylvestris (Chenchouni, 2012).

Therophytes occupy most of the site, which explains the disturbance of the environment.

According to (Arabi, 2016), the study of vegetation clearly shows the combined action of climate aridity and unfavourable human intervention. The biological spectra show a broad dominance of the Therophytes indicators of the degradation of the environment which are results testified by the same author.

5. CONCLUSION

This monograph sheds light on the nature of the flora of rivers located in north-eastern Algeria.

This richness is linked to the geographical location of the site and to the ecological condition which is reflected by the diversification of the species inventoried 80 species which are essentially Therophytes and Hemicryptophytes which are indicators of soil degradation and drought. Thus, these results obtained reveal very important threats linked to agro-pastoral practices (agro-pastoralism, pumping...) where riparian vegetation has been replaced by irrigated crops.

According to this study, we believe that vegetation degradation has exceeded the reversibility threshold

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