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Floristic cortege of the genre *Lavatera* a Malvaceae for the two species: *Lavatera maritima* and *L. flava* in the region of sabra (Tlemcen, Western of Algeria)

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ABSTRACT

This study is devoted to a phytoecological analysis of the Sabra region of Tlemcen, which is characterized by a high floristic diversity. Our work focuses on the study of malvaceous groups of the genre lavatera (*Lavatera maritima* and *Lavatera flava*) in the Sabra region. Our attention has been mainly oriented on the *Lavatera* of the malvaceae family. The floristic study has allowed us to enrich our knowledge of the existing biodiversity and the similarity that exists between these two genres. The floristic inventory of the floristic cortege of *Lavatera maritima* counts 31 families and the Eudicots are mostly dominating. The Mediterranean biogeographical type is a predominated one with a percentage of 57%. The floristic inventory of the floral cortege of *Lavatera flava* has 44 families, with the Eudicot dominating. The predominance species belongs to the Mediterranean biogeographical type (27.90%) with a therophytes dominating in the both species.

Key words : *Floristic inventory, Lavatera maritima, Lavatera flava, Malvaceae, Sabra, Tlemcen.*

Introduction

The Mediterranean world represents a real puzzle, both by its fragmented and heterogeneous model {extreme} and by its geology, which is certainly one of the most complex in the world (Quézel et Médail, 2003). Most Mediterranean forests represent unbalanced systems. These systems are generally well adapted in space and time to various constraints, and consequently to the modifications in dynamics or in the structure and architecture of the stands that they may generate (Barbéro et Quézel, 1989). The vegetation of Tlemcen is a good example of the study of plant diversity and above all an interesting synthesis of the natural dynamics of ecosystems, from the coast to the steppe (Stambouli et al., 2009). The analysis of the floristic richness of the different groups, their biological and chronological characteristics would allow us to emphasis their floristic originality, their state of conservation and their heritage value [4]. The objective of our work is to study the dynamics of vegetation and the difference between *Lavatera maritima* and *Lavatera flava* in the western region of Algeria. In order to achieve this objective, we have structured the content of this work in bibliographic analysis, biomorphology, methodology, diversity and floristic analysis of vegetation.

Methodology

The autumns and spring sets for the completion of the surveys took place in the years 2017 to 2019. The

floristic surveys were conducted in the types of stands covering our entire study area (Gehu Rivaz-Martinez, 1981). The number of surveys conducted in each homogeneous area depends on the diversity of ecological descriptors and the extent of each plant formation (Aafi *et al*., 1997; Aafi, 2003).

At the level of each survey, we mentioned geographic coordinates, soil characteristics, orography, substrate, structure and rate of layer recovery as well as the abundance-dominance coefficient (ADC) and sociability of each species.

The identification of taxa was made at the research Laboratory of Ecology and Natural Ecosystems Management at the university Abu Bakr Belkaid of Tlemcen using several reference books such as : Quézel and Santa (1962-1963), Fennane *et al*. (1999), Dobignard and Chatelain (2010-2013) for the updating of flora.

Results

Floristic catalog

Phytoecological surveys conducted in the field have led to the development of this flora catalog (Table 1).

The floristic cortege in Sabra station includes 34 species, with the dominance of Asteraceae (16.12%), *Cistaceae* and *Lamiaceae* with a percentage of 9.67%, followed by *Caryophylaceae, Oleaceae, Brassicaceae, Fabaceae, Poaceae* and *Convolvulaceae* with a percentage of 6.45%. The other families represent a very low rate.

In addition to the biological aspects, morphological type based on the morphological structure are also described. From biological, morphological and ecological point of view, these different kind of types constitute interesting characteristics in the study of the structure of plant formations.

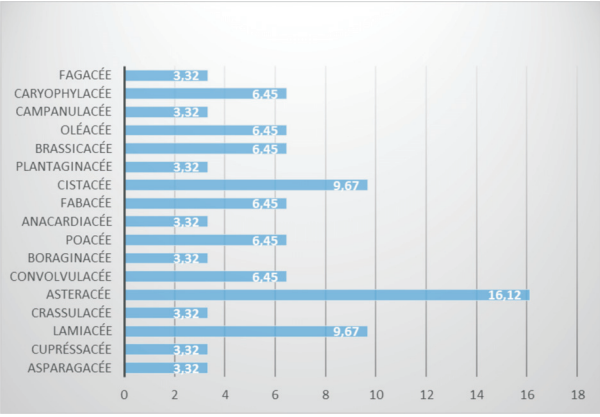

Fig. 1. Composition of the flora by family.

According to (Gadrat, 1999; Romane, 1987; Dahmani, 1997); the existence of a good correlation between biological types and many morphological characteristics was demonstrated. From the morphological point of view, perennial woody plants are dominant. Thirty six percent (36%), followed by 32.25% of perennial and annual grasses were represented in Sabra station respectively. The annual grasses with their R-type reproduction strategy are favoured by a short biological cycle and occupied the soil during the short periods favourable to their development in all bioclimatic groups and vegetation levels (Quézel, 2000).

The therophytes have a very high rate and they are dominant, but the chamephytes due to their adaptation to the drought, they are more present. They are more xerophilic (Benabadji *et al.,* 2004) and are generally favoured by grazing since they are rejected by the herd either because of their thorns or because of their often repulsive or toxic species (Bouazza *et al.,* 2010).

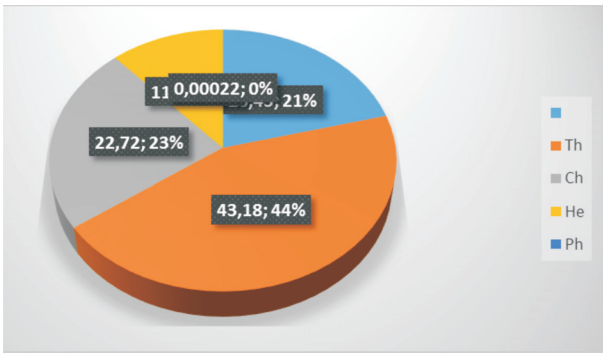

Fig. 2. Biological type.

The phytogeographic study also constitutes a real model for interpreting regression phenomena (Oliver *et al.,* 1995). For (Quézel, 1991), a phytogeographic study represents an essential basis for any attempt to conserve biodiversity (Quézel, 1991). Each phytogeographic region corresponds to "an element" according to (Eig, 1931): each well-delimited natural phytogeographic region, from the point of view of the physical base, has a special flora and vegetation and is thus their expression, their phytogeographic embodiment. From a phytogeographical point of view, the vegetation of the study area is made up of a heterogeneous set of elements of various northern and southern Mediterranean origins.

The analysis of Figure 5 shows the dominance of Mediterranean biogeographical type (Med) species in the study area with a percentage of 57%, followed by the Western Mediterranean (W-Med) elements with a percentage of 7%. The European-Mediterranean (Euro-Med) element represent 4%. The Eurasian element (Euras) and Portugal A-N occupy the fourth position with 3% only. The rate of the rest of the species are very low, but also they contribute to the diversity and richness of the phytogeographical potential of the study area, among which Iber_Maurit_Malta, Ibero-Maur, circum-Med...etc.

The floristic cortege in the Sabra station related to the *Lavatera flava* genre includes 44 species with the dominance of the *Asteraceae* (25%) followed by the *Poaceae* (20.45%) and the *Asparagaceae/Lamiaceae* (6.81%).

Biological spectrum

The biological spectrum according to (Gaussen *et al.*, 1982) is the percentage of the various biological types. The dominance of one biological type permit to give the name of the plant formation. This is therefore the physiognomic expression, which reflects the environmental conditions. The vegetation studied is currently characterized by the type: Th > Ch > He > Ge > Ph. Therophytes present a very high rate with a percentage of 43.18%. They are considered as dominate one in Sabra station. This phenomenon is linked to frequent overgrazing.

Chamaephytes are also well represented and they are better adapted to drought than Phanerophytes. They are more xerophilic and generally produce many seeds (Bouazza et Benabdeji, 2002; Aouadj *et al.*, 2020). The low percentage of Phanero-

Table 1. Floristic inventories that concern *Lavatera maritima* in the region of Sabra.

espèces	Fam	T.m	T.b	T.Biog
Asparagus albus	Asparagaceae	H.v	Ge	W-Méd
Tetraclinis articulata	Cupréssaceae	L.v	Ph	Iber_Maurit_Malte
Lavendula multifida	Lamiaceae	L.v	Ch	Méd
Sedum sediforme	Crassulaceae	H.v	He	Méd
Asteriscus maritimus	Asteraceae	H.v	Ch	Canaries, Eur. mérid. A.N.
Convolvulus cantabricus	convolvulacea	H.a	Th	Méd
Convolvulus althaoides		H.a	Th	Macar -Méd
Centaurea pullata	Asteraceae	H.a	Th	Méd
Echium plantagineum	boraginaceae	H.v	He	Méd-Eur-Asie-Afr
Avena sterilis	Poaceae	H.a	Th	Macar-Méd.-IranoTour
Pistacia lentiscus	Anacardiaceae	L.v	Ch	Méd
Nepeta multibracteata	Lamicaceae	H.v	He	Portugal A.N.
Pallenis spinosa	Asteraceae	H.v	Ch	Eur-Méd
Ballota hirsuta	Lamiaceae	H.v	He	Ibéro-Maur
Calycotome intermedia	Fabaceae	L.v	Ch	Méd
Centauria pullata	Asteraceae	H.a	Th	Méd
Fumana thymifolia	Cistaceae	L.v	Ch	Euras. Af. Sept,
Stipa parviflora	Poaceae	H.v	Ge	Méd
Plantago albicans	Plantaginaceae	H.v	He	Méd
Eruca vesicaria	Brassicaceae	H.a	Th	Méd
Phillyrea angustifolia	Oléaceae	L.v	Ph	Méd
Campanula dichotoma	Campanulaceae	H.a	Th	Méd
Lobularia maritima	Brassicaceae	H.a	Th	Méd
Spergularia purpurea	Caryophylaceae	H.a	Th	Méd-Esp-Port
Inula viscosa	Asteraceae	H.v	Ge	circumméd
Cistus villosus	Cistaceae	L.v	Ch	Méd
Ceratonia siliqua	Fabaceae	L.v	Ph	Méd
Quercus quoccifera	Fagaceae	L.v	Ph	W-Méd
Olea europea	Oléaceae	L.v	Ph	Méd
Cistus monspeliensis	Cistaceae	L.v	Ch	Méd
Silene vulgaris	Caryophylaceae	H.a	Th	Euras

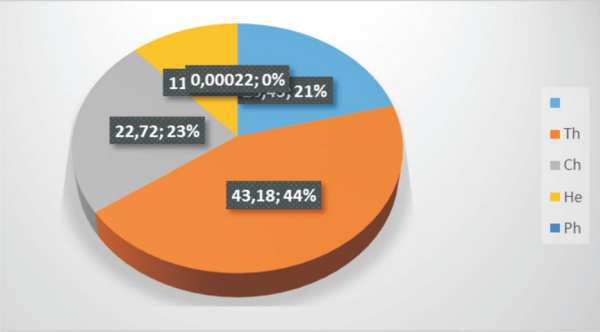

Fig. 3. Biological type.

phytes (0.0002%) allowed us to confirm the degradation of the vegetation mat.

Morphological characteristics

The biological type leads to the natural shape of the plant. The precise aspect of the shape obtained depends on environmental variations (Gadrat, 1999; Romane, 1987; Aouadj *et al.*, 2019). In their study, (Dahmani, 1997) have demonstrated the existence of a good correlation between biological types and many morphological characteristics.

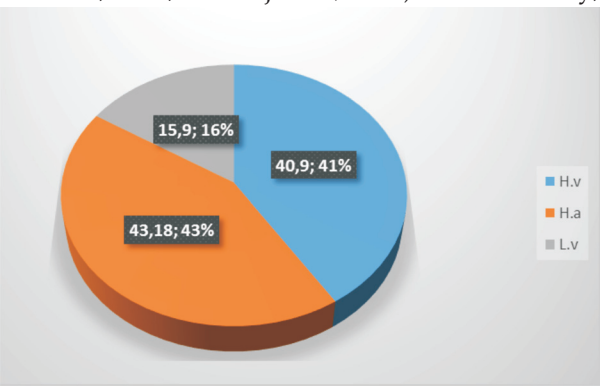

Fig. 4. Morphological types

Biogeographic Characteristics

Geobotany is defined as the science which focus in the study of the description, the interpretation and the prediction of population distribution patterns and the plant taxa in space and time. The geobotany deals also with the conditions and the laws to which the plant respond. It involves synecology, phytoecology and phytogeography (Hengevel, 1990). It's noted the dominance of annual herbaceous plants, followed by perennial herbaceous plants and finally perennial woody plants.

Biogeographic analysis

Biogeographic analysis of the current flora can provide valuable information on the modalities of their establishment and especially in the light of paleohistorical data published recently (Walter and

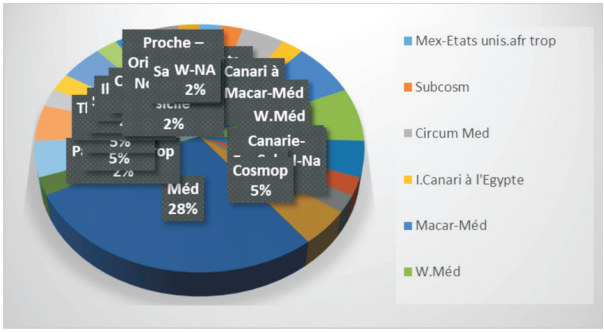

Fig. 5. Biogeographic types

Table 2. Floristic inventories that accompany lavatera flava in the region of Sabra Tlemcen (Algeria).

Taxa	Famille	TB	TM	TBiog
Agave americana	Asparagaceae	H.v	Ge	Mex-Etats unis.afr trop
Anagalis arvensis	Primulacea	H.a	Th	Subcosm
Arisarum sp	Araceae	H.v	Ge	Circum Med
Artemisia herba alba	Asteraceae	H.v	Ch	I.Canari à l'Egypte
Asparagus stipularis	Asparagaceae	H.v	Ge	Macar-Méd
Asparagus albus	Asparagaceae	H.v	Ge	W.Méd
Asphodelus microcarpus	Asphodelaceae	H.v	Ge	Canar.Méd
Asteriscus maritimus	Asteraceae	H.v	He	Canarie-EurMerid-Na
Atractylis cancellata	Asteraceae	H.A	Th	Circum Méd
Atractylis carduus	Asteraceae	H.v	Ch	Sah
Atriplex halimus	Chénopodiaceae	L.v	Ch	Cosmop
Brachypodium distachyum	Poaceae	H.a	Th	Méd
Bromus rubens	Poaceae	H.a	Th	Paleo-Sub-trop
Calendula arvensis	Asteraceae	H.a	Th	Sub-Méd
Centaurea pullata	Asteraceae	H.a	Th	Méd

Straka, 1970 ; Axelrod, 1973 ; Axelrod and Raven, 1978 ; Pignati, 1978 ; Quézel, 1978 ; Quézel, 1985 ; Quézel, 1995).

Fig. 5. Shows the predominance of Mediterranean biogeographical type species with a percentage of 28% followed by the Macard-Mediterranean and W-Mediterranean with 6.97%. The rest represents a low presence; but contributes to the diversity and richness of the phytogeographical potential of the Sabra region as well.

Conclusion

The exhaustive inventory carried out at the Sabra study station has permitted to carry out the biological and morphological phytogeographical characteristics, as well as a distribution of the species in botanical families and to highlight the floristic procession of the two species lavatera maritima and lavatera flava. This present study can be summarized in the following points:

1. In our study station and with the two species considered, the most dominant families are:
   a. Asteraceae, Lamiaceae and Cistaceae in the floristic cortege of lavatera maritima.
   b. The asteraceae, poaceae, and lamiaceae in the lavatera flava cortege.
2. The dominant biogeographic type is the Mediterranean type in both species.
3. The biological spectrum of the Sabra station is of type at lavatera maritima is of type TH > CH > HE = PH > GE.
4. The biological spectrum of the Sabra station is of type at lavatera flava is of type TH > CH > HE > GE > PH.
5. The dominance of the therophytes confirms the phenomenon of therophytization; the ultimate stage of degradation in both species.
6. The comparison of the biological spectra shows the importance of the therophytes which testifies to an inevitable therophytization. The therophytization of plant structures is reminiscent of the degradation of certain ecosystems that tend to turn into lawns.

In conclusion, our study shows the richness of the Sabra station at the natural, landscape, botanical and historical levels.

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