

Effect of put in defense in the restoration and rehabilitation of plant cover in Oranie Region (Algeria)

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Abstract

Located in a region of transition from a climatic point of view and hardly tolerating the summer drought, the natural vegetation of Mediterranean countries is fragile and it has not withstood the thousand-year-old degradation of man (Huelz, 1970). For this purpose a phytodynamic study was conducted between 2010-2011 and 2013-2015, this approach to floristic composition consists on the one hand of estimating the role of climatic constraints and on the other of evaluating the intensity of anthropogenic action, to this end, a defensive station was chosen.

In order to test the dynamics and fluctuation of the flora, which are assessed by comparison of the floristic lists inventorying all the vascular plants representative of the different plant formations according to the method of Braun Blanquet (1951) and indices such as the disturbance index and the Shannon and fairness index, a phytoecological study of the vegetation was carried out in the North-West region of Algeria in two different periods, current (2013-2015) and past (2010-2011).

We observed a trend in flora species increase during

the three years of monitoring (2013-2015) in the area of defense, where, the floristic fund and collection are dominated by widely distributed species (Mediterranean and West Mediterranean, etc.) that come at the top for the phytogeographic spectrum, also the stability of the environment has been determined by the number of perennial species more or less important where forest species (*Tamarix Gallica* and *Pinus halepensis*) have been identified in the protected station.

The disturbance index calculation results indicates that the vegetation of the protected station of the Hammam Boughrara Dam increased between 2010-2011 and 2013-2015, where the disturbance index has increased slightly from 80% to 76.56%, the setting in defense made it possible to obtain a good evolution of the plant density and the floristic diversity so defensiveness has an effect on the vital attributes of vegetation, which results in improved seed production and can also allow restoration of the natural plant carpet, improved soil cover by several plant species and increased phytomass.

Keywords: Put in defence, Flore, anthropization, phytodynamics, Hammam Boughrara (Oranie, Algeria)

Résumé

Située dans une région de transition d'un point de vue climatique et tolérant difficilement la sécheresse estivale, la végétation naturelle des pays méditerranéens est fragile et n'a pas résisté à la dégradation millénaire de l'homme (Huelz, 1970). A cet effet une étude phytodynamique a été menée entre 2010-2011 et 2013-2015, cette approche de la composition floristique consiste d'une part à estimer le rôle des contraintes climatiques et d'autre part à évaluer l'intensité de l'action anthropique, à cet effet, une station défensive a été choisie.

Afin de tester la dynamique et la fluctuation de la flore, qui sont appréciées par comparaison des listes floristiques inventoriant toutes les plantes vasculaires représentatives des différentes formations végétales selon la méthode de Braun Blanquet (1951) et des indices tels que l'indice de

perturbation et l'indice de Shannon et d'équité, une étude phytoécologique de la végétation a été réalisée dans la région du Nord-Ouest de l'Algérie à deux périodes différentes, actuelle (2013-2015) et passée (2010-2011).

Nous avons observé une tendance à l'augmentation des espèces floristiques au cours des trois années de suivi (2013-2015) dans la zone de la défense, où, le fonds floristique et la collection sont dominés par des espèces largement distribuées (méditerranéennes et méditerranéennes occidentales, etc.) qui viennent à le sommet pour le spectre phytogéographique, également la stabilité du milieu a été déterminée par le nombre d'espèces pérennes plus ou moins importantes où des espèces forestières (*Tamarix Gallica* et *Pinus halepensis*) ont été identifiées dans la station protégée.

Les résultats du calcul de l'indice de perturbation indiquent que la végétation de la station protégée du barrage de Hammam Boughrara a augmenté entre 2010-2011 et 2013-2015, où l'indice de perturbation a légèrement augmenté de 80% à 76,56%, la mise en défense a permis d'obtenir une bonne évolution de la densité végétale et de la diversité

floristique; Ainsi, la défensive a un effet sur les attributs vitaux de la végétation, ce qui se traduit par une meilleure production de graines et peut également permettre la restauration du tapis végétal naturel, une meilleure couverture du sol par plusieurs espèces végétales et une phytomasse accrue.

Keywords : Mise en défens, Flore, anthropisation, phytodynamique, Hammam Boughrara (Oranie, Algérie)

1. Introduction

Vegetation makes it possible to characterize the state of the ecosystem and to highlight its natural or induced modifications, because it is the best result of the climate and the soil (Ozenda, 1986), however, the distribution of a taxon over a territory is not continuous, even if the taxon can colonize many more localities as his observations do not show, its intermittence is most often linked to contingent factors such as the seed dispersal capacity, interspecific competition or even anthropogenic action.

Flowering plants, because of their strict ecological requirements, are good indicators of the conditions in which they develop, by elsewhere, as the least mobile organisms, one can think that they best express landscape dynamics and easily reveal the impact of human activities on biodiversity in agricultural

landscapes (Polunin, 1967; Burel et al., 1998), and to better understand the dynamics of vegetation cover, expressed by the kinetics of succession over time, it is necessary to recall the notions of resilience, vegetation sequence and healing rate (Godron, 1984). It is also necessary to understand well the processes of plant response (extinction, migration or persistence) to the global changes of the past, in order to better estimate those of the future (Medail et al., 2012).

Defense is the technique of resting degraded surfaces to promote the regeneration of plant and soil cover (Delwaule, 1975). It allows a degraded space to evolve in a manner comparable to an ecosystem in close relation to the natural characteristics of the environment that houses it (Floret and Pontanier, 1982).

This article stemming in part from previous work 2010-2011 (Benabdelmoumene, 2011) and recent work

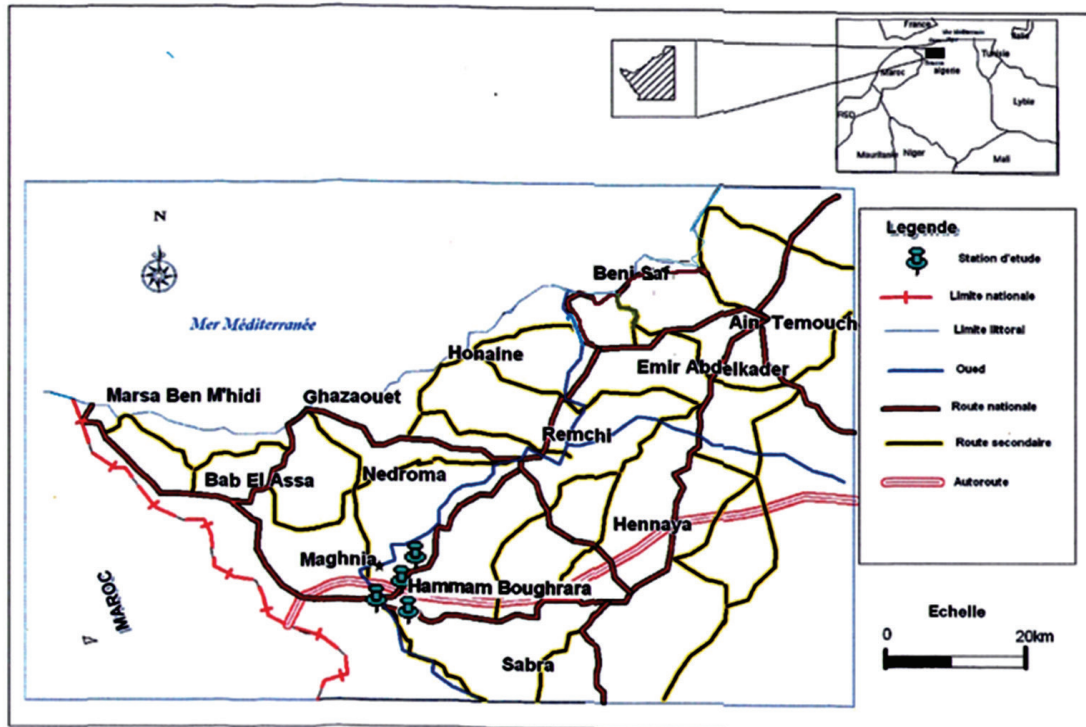


Figure 1: Geographical location map of the study stations

2013-2015 (Benabdelmoumene, 2018), it is based on diachronic analysis of the plant formations identified by a type of land use and their structures, with the aim of highlighting and understanding the changes in the spatial organization of landscape structures over time under the impulse of human and natural activities.

2. Materials and Method

2.1. Material

- Studying Site

The study area is located in the North West of Algeria, belonging to the Tlemcen wilaya, it is characterized by weak slopes, a weak vegetative cover and a friable substrate where different forms of erosion are observed. The region is located between 34 ° 58 'N latitude and 1 ° 40' W longitude. However, stands of *Artemisia Herba alba* show a significant increase to the detriment of pastoral quality plants.

2.2. Method

To test the dynamics and fluctuation of the flora species,, which are appreciated by comparison of floristic lists and indices such as the disturbance index and the Shannon index, a phytoecological study of vegetation was carried out in the north-western region of Algeria (Hammam Bouhrara), which is based on spatio-temporal analysis of floristic lists inventorying all the vascular plants representative of the different plant formations according to the method of Braun Blanquet (1951) in two different periods (2010-2011) and (2013-2015).

In our case, we used the method of surveys by transect in plots (100 m²) which consists in choosing locations as typical as possible by noting the environmental

conditions (Gounot, 1969), since linear analysis does not give an exhaustive inventory of the floristic composition of a plant group, but it nevertheless makes it possible to determine the main dominant species in these anthropized environments for the most part and the therophytic species, which are often very numerous with a short cycle, with their respective specific contributions (Cesar, 1990).

3. Results

Study stations (table 1) are floristically rich with 84 species identified at the control station level and 40 species in the protected station between the periods 2010-2011, this floristic richness is slightly modified during the periods 2013-2015, where we recorded 87 species in the control station area and 64 species in the protected station.

Assessing the diversity of flora genera is also important, estimated for the period (2010-2011) 75 genres for the test station, 36 genres at the level of the protected station, and for the recent periods of 2013-2015, we note a decline in the control station (71 genera). On the other hand, the protected station marks a biological ascent compared to the previous period when we counted (56 genera). Most genera are represented by only one family (Asteraceae) and correspond mainly to herbaceous plants.

The diversity of families of the flora is 33 families for the control station and 18 families at the level of the station put in defense for the period 2010-2011, the period from 2013 to 2015 recorded 35 families in the control station, 29 families at the protected station, it is mainly represented by the Asteraceae family and the Poaceae.

Table 1: Number of herbaceous and woody species, genera and families found on a control station and a protected station

Stations	2010 - 2011			2013 - 2015		
	Number of species	Number of families	Number of Genres	Number of species	Number of families	Number of Genres
Witness station	84	33	75	87	35	71
Protected station	40	18	36	64	29	56

Table 2: Diahronic study of Shannon's index in the protected and control stations

Stations	2010-2011		2013-2015	
	H'	E	H'	E
Witness station	3.13	0.41	3.12	0.48
Protected station	3.62	0.67	4.16	0.68

Shannon - Weaver 1947 diversity index

$$H' = -\sum ((N_i / N) \log_2 (N_i / N))$$

N_i : Number of individuals of a given species, i :
Range from 1 to S (total number of species).

N : Total number of individuals.

The protected station recorded (table 2) a slight increase of the vegetation cover in climatic circumstances

marked by aridity, this progression is the result of the defense, and on the other hand, the control station experienced regressive dynamics where woody vegetation regressed due to erosion. The axis on figure 2 follows a gradient of humification in which the species of poor soils appear on the positive side *Malva sylvestris*, *Lygeum spartum*, *Hordeum murinum*, as opposed to the negative side, post-cultural species

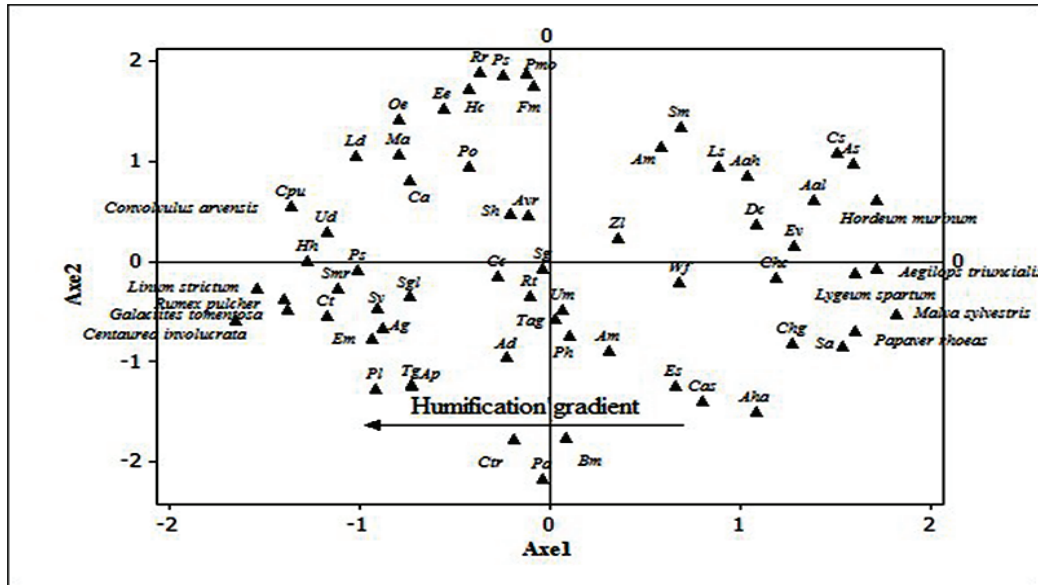


Figure 2: Factorial plan of the species of the protected station (Axis 1, Axis 2)

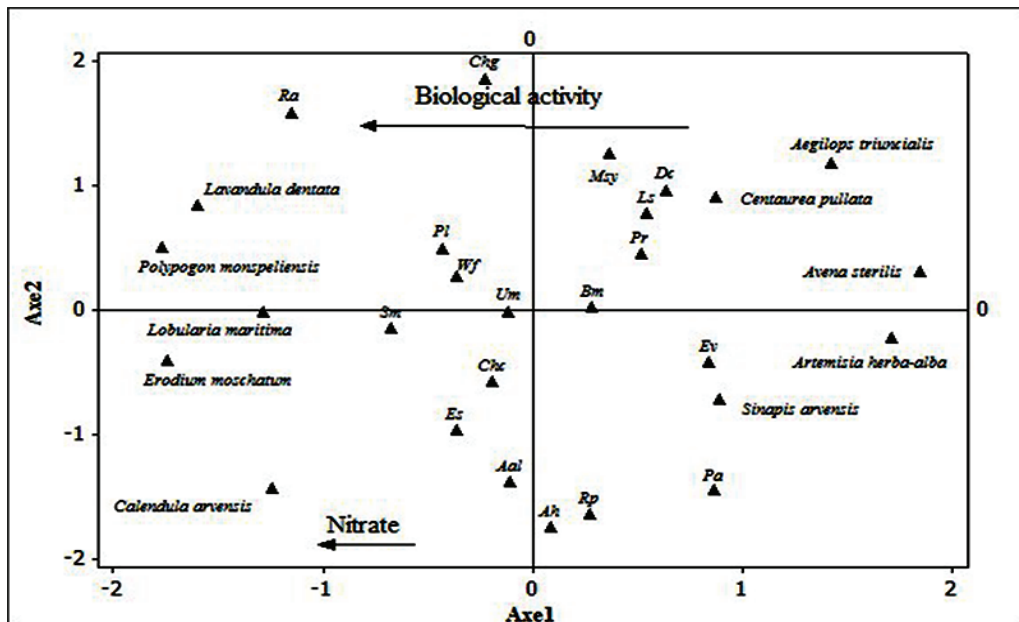


Figure 3: Factorial design of the species of the control station (Axis 1, Axis 2)

occupy a large area *Centaurea involucreta*, *Linum strictum*, *Rumex pulcher*. The defensive approach allows a significant rise of the forage flora.

This axis (figure 3) reflects the level of biological activity from the positive side to the negative side where the taxa of a lawn settle on the positive side: *Avena sterilis*, *Aegilops triuncialis*, *Sinapis arvensis*, while the negative side shows a neutrophilic tendency: *Polypogon monspeliensis*, *Erodium moschatum*, however Balent et al. (1998) show that grazing increases specific diversity when intensity is average, and decreases it when intensity of grazing is high.

4. Discussion

The results show that the vegetative cover is decreasing with, however, a growth of some xenic species such as : *Artemisia herba-alba*, *Lygeum spartum*, *Atriplex halimus* and *Chamaerops humilis*, Although several authors Grouzis (1988), Lericollais (1987), Warren and Agnew (1988) state that vegetation degradation is manifested by a significant decrease in vegetation cover, disappearance of woody species (*Pistacia Atlantica*, *Olea Europea*) and progressive replacement by grasses (*Hordeum murinum*, *Lygeum spartum*, *Bromus madritensis*) and annuals (*Echium vulgare*, *Plantago ovata*, *Sinapis arvensis*, *Asteriscus maritimus*) with very short cycles and by species without pastoral use such as *Atractylis gummifera*, *Ziziphus lotus* and *Echinops spinosus*.

We observe a trend increase in the flora, especially species with a pastoral vocation (*Trifolium angustifolium*, *Papaver rhoeas*, *Avena sterilis*, *Carex punctata*) during the three years of monitoring (2013-2015) in the protected area, which confirms the achievements of Floret and Pontanier (1982) where a three-year defense succeeds in multiplying by 10 the value of the aerial phytomass of the annuals and doubles the quantity of the consumable biomass. As well, the setting has an effect on the vital attributes of the vegetation which results in an improvement of the seed production (Berkat, 1986) and can also allow the restoration of the natural plant cover by improving soil cover by several plant species and increasing plant mass (Acherkouk and Maatougui, 2008).

Wagner (1976) even concluded that one could not speak of estates (or sequences) since the weak development of the vegetation did not allow sufficient influence of it on the physical environment to create new environmental conditions, therefore, ecosystem

performance appears to be more related to the functional attributes of the species (Gime, 1977; Hooper and Vitousek, 1977).

5. Conclusion

The floristic fund and the recovery are dominated by widely distributed species (Mediterranean and West Mediterranean...) which comes first for the phytogeographic spectrum, also the stability of the environment was determined by the number of more or less important perennial species where forest species (*Tamarix gallica*) have been identified on the edge of Oued Tafna.

This study shed some light on the nature and state of the flora species, and the feasibility of the diachronic study of the flora of the study stations, which indicates that the ecosystem is affected by the various anthropogenic and climatic issues. Among other things, it is clear that the analysis of wealth at different periods shows that the period 2013-2015 has a significant wealth of flora species compared to the period 2010-2011 which has a less rich floristic diversity. This gradual change in vegetation can be translated into a defensive approach, which has led to a good change in plant density and floristic diversity.

The results of the disturbance index calculation, indicate that the vegetation of the protected station of the Hammam Boughrara Dam increased between 2010-2011 and 2013-2015, where the disturbance index has increased slightly from 80% to 76.56%.

As recommendations could we still point out

- To be able to ensure sustainable management and rational exploitation of the ecosystem while protecting the capital of natural resources against any degradation caused by their irrational uses, particularly frequent practices in North Africa (Quézel, 2000).
- Promote the planting of fodder trees and shrubs.
- Develop and encourage best ecosystem management practices.

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