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Impact of Over-Grazing on Plant Diversity and Phyto-Geographical of the Steppe Ecosystems of Southern Oran (Western Algeria)

KEYWORDS: Floristic diversity, phyto-geography, steppe, Western Algeria

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ABSTRACT *Ecosystems of southern Oran (Western Algeria) are currently exposed to climatic and anthropogenic impact unprecedented.*

This study proposes an inventory of plant species in three steppe formations at Stipa tenacissima impacted differently. The method used is based on the abundance dominance. The taxa identified are classified on systematic and biogeographical.

The floristic inventory indicates a regressive dynamic training Stipa moving from one site to another. 39 plant species have been recorded in the site Stipa in good condition, against 26 for the site moderately degraded and 16 species only for the degraded site.

Endemic species (Muricaria prostata; Astragalus armatus; Erucastrum leucanthum); Saharan taxa (Bassia muricata, Centaurea pungens) and Saharo-Sindiens (Senecio flavus Erucaria uncata) have disappeared from the degraded site.

We are witnessing a change in the steppe physiognomy in which toxic and / or thorny species are growing (Paronychia argentea; Peganum harmala; Eruca vesicaria) at the expense of palatable species.

INTRODUCTION

Arid and semi-arid regions of North Africa are currently experiencing the degradation of natural resources. The vegetation (forest, meadow-forest, shrubland and steppe) regress under the climatic and anthropogenic action. Steppe regions are the real rangelands and the population is mainly agro-pastoralists (Nadjraoui and Badrani, 1980). Currently there is a restructuring of the steppes; this new situation is characterized by the development of settlements and the settlement of nomads which causes an alarming ecological imbalance.

Many researchers agree that the steppes of western Algeria experiencing regressive dynamics (Benabadji, 1995; Bouazza, 1995; El Zerey *et al*, 2009) and desertification which is not linked to climate perturbations (Couderc, 1979; Aidoud, 1983).

Between 1950 and 1970 the perennial aboveground plant biomass was in the range of 800 to 1500 kg MS / ha with an overlap of 10-30%, in 1985 plant biomass is less than 200 kg MS / ha and the overlap of the vegetation is of less than 15% (Le Houerou, 1985).

This is mainly overgrazing, increased livestock and poor rangeland management that cause degradation. The adverse consequences on the future of natural resources are to be feared.

This is in order to understand the dynamics of steppe species in southern Oran that this study was conducted. The Systematic and biogeographically approach will identify the trends of each species and highlight the dangers bioresources.

MATERIALS AND METHODS

➢ Presentation of the study area

The study area is located south of the province of Saida (Figure 1). It is characterized by an rainfall oscillating between 81.5 and 356 mm / year with a significant variation between years; 37 days of frost on average recorded from December to March and 11 days of sirocco from May to August (Hasnaoui *et al*, 2011).

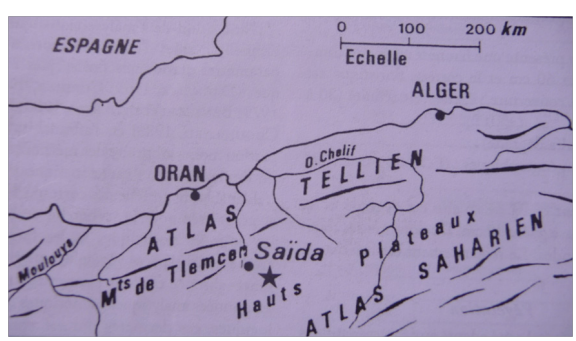

Figure 1: Location of the study area

➢ **Choice and geo-location stations:**

The stations choice was motivated by the persistence of local populations of *Stipa* little or no damaged. This physiognomic descriptor has allowed us to identify three representative stations:

Station 1: Geographic coordinates: X 0° 35'32 W – Y 34° 41'01 N. This station received a bet in defends and the *Stipa* is in good condition (S.G.C), we observed a major biomass of species and the floristic diverse is importante. The average height of the feet of *Stipa* exceeds 60 cm.

Station 2: Geographic coordinates: X 0° 36' 19 W – Y 34° 40' 15 N. The station has not benefited from protection and the population of *Stipa* is moderately degraded (S.M.D); the average height of the vegetation is between

Volume : 4 | Issue : 10 | October 2014 | ISSN - 2249-555X

30 and 60 cm and the richness floristic is reducing.

Station 3: Geographic coordinates: X 0° 36' 15 E – Y 34° 39' 59 N. It is a free rangeland and *Stipa* is degraded (S.D) and height rarely exceeds 35 cm. Many feet at *Stipa* are dying.

➢ **Study of vegetation**

The vegetation inventory was made based on the stigmatic method (Braun-Blanquet, 1951) and the approach has been adapted to the characteristics of steppe formations whose stands are discontinuous. 30 floristic surveys were conducted during good phenological period. An area of 400 m^2 was deliberately chosen for our sample (Guinochet, 1973; Long, 1974). Plant species were identified using identification keys of Quézel and Santa (1962).

RESULTS AND DISCUSSION

➢ **Analysis of the vegetation**

The inventory of species has allowed us to identify 14 families and 33 genera including 4 multi-species (*Stipa*, *Helianthemun*, *Senecio* and *Astragalus*). Asteraceae, Poaceae and Brassicaceae are the most important families with 20 species in total, or 50% of the biodiversity identified. The Cistaceae, Caryophyllaceae and Fabaceae are represented by three species each representing 25% of the total. Chenopodiaceae Iridaceae and are represented by two species each and finally the rest of the families are represented by one species in each case (Figure 2).

All recorded species are adapted to local conditions (climate aridity and soils with low organic matter and generally sandy texture).

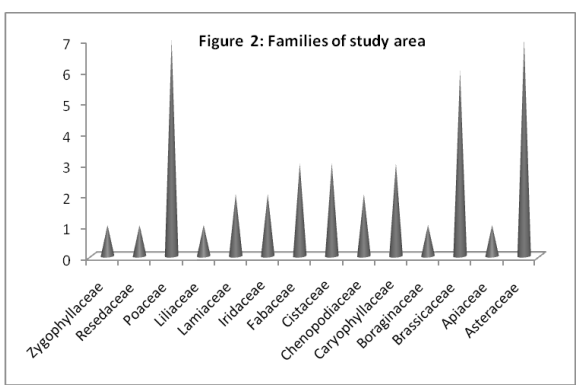

Figure 2: Families of study area

➢ **Biogeographic analysis**

Analysis of Table 1 shows a significant biogeographic diversity. We found 23 biogeographical origins, the most important property of all is (Med.) Mediterranean (10 sp) followed by W-med, Sah., Sah- Sind., Paleo-Temp., Paleosubtrop. with 2 species for each origin and have a reduced frequency for the another origins.

The items Saharo-sindiens are represented by four species: *Senecio flavus Erucaria uncata, Bassia muricata* and *Centaurea pungens*. This group of species is adapted to aridity.

Among the recorded species we find:

i- Steppe species: *Stipa tenacissima, Peganum harmala, Artemisia herba alba*;
ii- Species endemic to western steppes of Algeria: *Erucastrum leucanthum, Muricaria prostrata, Astragalus armatus;*
iii- Species of the Saharan Atlas: *Saponaria glutinosa;*
iv- Pasture species and desert rock: *Stipa parviflora, Poa bulbosa, Noaea mucronata, Centaurea pungens, Helianthemum lipii, Helianthemum pilosum, Erucaria uncata, Astragalus sesameus, Alkanna tinctoria, Schismus barbatus* et *Matthiola longipetala*.

The Other species are polymorphic and are present throughout Algeria.

➢ **Dynamics of plant species**

The Algerian steppes are now coveted and exposed to an alarming overgrazing. The comparison of floristic surveys shows the dynamics of the vegetation. From the frequencies of species inventoried we could see the trends of taxon in each station (Table 1).

Tableau 1: Frequency and evolutionary trends of species in the study area.

Plant species	Type biogeographic	Frequency			Trend
		S.G.C	S.M.D	S.D	
Stipa tenacissima L.	Ibér-Maur.	0,8	0,5	0,4	↘
Poa bulbosa L.	Paléo-Temp.	0,7	0,7	0,6	↘
Stipa parviflora Desf	Méd.	0,7	--	--	disappearance
Alkanna tinctoria Tausch	Méd.	0,6	0,5	--	disappearance
Astragalus sesameus L.	W.Méd	0,6	0,5	--	disappearance
Bassia muricata Asch.	Sah.	0,6	0,4	0,3	↘
Diplotaxis virgata L.	Ibér-Maur.	0,6	0,6	--	↘
Erucaria uncata Asch et Schw	Sah.Sind	0,6	--	--	disappearance
Muricaria prostrata Desv.	End.	0,6	--	--	disappearance
Noaea mucronata Asch et Schw.	Méd-Iran-Tour	0,6	--	0,5	↘
Schismus barbatus Thell	Macar-Méd	0,6	0,6	0,3	↘
Scorzonera undulata Vahl	Med.	0,6	0,5	--	↘
Senecio vulgaris L.	Subcosm.	0,6	---	--	disappearance
Astragalus incanus L.	W.Méd	0,5	0,5	0,6	↘
Avena sterilis L.	Méd. Irano. Tour	0,5	0,5	0,8	↘
Bromus rubens L.	Paléosubtrop.	0,5	0,6	0,6	↘
Centaurea pungens Pomel	Sah.	0,5	0,4	--	disappearance
Eruca vesicaria Car.	Méd.	0,5	0,4	0,6	↘
Hordeum murimum With	Méd. Eur. Amér.	0,5	0,6	0,5	↘
Astragalus armatus Willd	End. N.A	0,4	0,7	--	disappearance
Helianthemum lippii Pers.	Méd. Sah.	0,4	--	--	disappearance
Helianthemum pilosum Pers	Méd.	0,4	0,4	--	disappearance
Iris sisyrinchium L.	Paléosubtrop.	0,4	--	--	disappearance

Volume : 4 | Issue : 10 | October 2014 | ISSN - 2249-555X

Ornithogalum pyramidale L.	Circumméd.	0,4	--	--	disappearance
Reseda lutea L.	Eur.	0,4	--	--	disappearance
Salvia verbenaca Briq.	Méd. Atl	0,4	--	--	disappearance
Saponaria glutinosa M.B	Méd.	0,4	0,4	--	disappearance
Chrysanthemum coronarium L.	Méd.	0,3	--	--	disappearance
Erucastrum leucanthum Coss et Dur.	End. Alg. Mar.	0,3	0,3	--	disappearance
Marrubium vulgare L.	Cosm.	0,3	--	--	disappearance
Matthiola longipetala Maire	Méd. Sah. Sind	0,3	0,3	--	disappearance
Muscari comosum Mill.	Méd.	0,3	--	--	disappearance
Paronychia argentea Lamk.	Méd.	0,3	0,6	0,5	↘
Peganum harmala L.	Iran-Tour-Eur.	0,3	0,5	0,7	↘
Senecio flavus Sch. Bip.	Sah. Sind.	0,3	0,3	0,7	↘
Artemisia herba alba Asso.	Esp, des Canaries à l'Egypte, Asie	0,2	0,3	0,3	↘
Ferula communis L.	Méd.	0,2	0,5	--	disappearance
Herniaria hirsuta L.	Paléo-Temp.	0,2	0,4	--	disappearance
Micropus bombicinus Lag.	Euras. N.A. Trip.	0,2	0,5	0,5	↘
Helianthemum virgatum Pers.		--	--	0,4	disappearance

The arrow indicates the evolutionary trend for each species

We note an important floristic richness in the S.G.C site and frequency of species is good.

In the S.M.D site the number of species is reduced and palatable species are declining.

The S.D site is marked by a significant reduction in palatable species and the anthropogenic species persist. The most important point is the disappearance of the station S.D of endemic species and / or of steppes (*Erucastrum leucanthum; Saponaria glutinosa; Muricaria prostrata; Matthiola longipetala; Centaurea pungens; Erucaria uncata; Alkanna tinctoria*) and increased frequency of species despised by the animals (*Paronychia argentea*; *Peganum harmala; Micropus bombicinus; Eruca vesicaria).*

The appearance of *Helianthemum virgatum* show the degradation of the ecosystem studied.

The evolutionary trend of species is related to the over grazing of the ecosystems on the one hand and changes in the physico-chemical characters of soils on the other hand (Borsali et *al*, 2014; Hasnaoui et *al*, 2011).

CONCLUSION

The Steppes at *Stipa* are undergoing unprecedented the erosion of plant genetic resources. This situation has become alarming and continues to grow. Endemic species have disappeared (*Muricaria prostrata, Erucastrum leucanthum*) and are replaced by toxic and / or thorny species (*Peganum harmala, Avena sterilis* and *Astragalus incanus).* A change in the steppe physiognomy settled with the dominance of species despised by the animals. This evolving trend leads to an alarming desertification. The modifications induce depletion of the biological potential and the phenomena of degradation are fast and call for strong measures for the protection and restoration of steppe ecosystems.

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