

The floristic and chemical composition of the grass of permanent grasslands in north-east Algeria

A composição florística e química da erva dos prados permanentes no nordeste da Argélia

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ABSTRACT

This work shows that the botanical composition of the meadows studied according to the region and that the grass family is less well represented in R.Souk (13%) and Ain Khiair (14%) than in Oued El-Hout (18%). The Ain-Khiair region is dominated by leuminous plants (43%). Thus, all the grasslands studied do not follow the laws classically described for grasslands, namely the dominance of grasses followed by legumes. Differences were observed between the chemical compositions of grasslands. The Ain-Khiair region is distinguished in particular by higher average contents of mineral matter (24.6% DM) and crude protein (14.32% DM).

Keywords: Asteraceae, Fabaceae, floristic richness, pasture

RESUMO

Este trabalho mostra que a composição botânica dos prados estudados por região e que a família das gramíneas está menos representada em R.Souk (13%) e Ain Khiair (14%) do que em Oued El-Hout (18%). A região de Ain-Khiair é dominada por plantas leuminosas (43%). Assim, todos os campos estudados não seguem as leis classicamente descritas para os campos, ou seja, a predominância de gramíneas seguidas de leguminosas. Foram observadas diferenças entre as composições químicas dos campos. A região de Ain-Khiair distingue-se em particular pelos maiores teores médios de matéria mineral (24,6% MS) e proteína bruta (14,32% MS).

Palavras-chave: Asteraceae, Fabaceae, riqueza florística, pastagem

1 INTRODUCTION

In the extreme north-east of Algeria, livestock farming, mainly meat, is carried out extensively on pasture. Natural grasslands are one of the main pastures (MATALLAH et al.; 2014). They can also play a very important role in the diversification of fodder resources and the reduction of the fodder deficit (ABDELGUERFI ; HAKIMI, 1990). According to (HUBERT ; VIAUX, 2004), permanent grasslands are rich and diversified environments recognized for their major role in preserving biodiversity. They are also, of course, essential for the farmers who use them because of their primary function of fodder production. However, throughout the year, the meadow undergoes constraints and attacks (drought, excessive humidity, trampling, overgrazing, etc.), thus posing the problem of regeneration and sustainability. In this context, it was considered necessary to analyze the floristic richness and the quality of the natural grasslands of the extreme north-east of Algeria, to produce knowledge allowing the development of a good management of these rangelands.

2 MATERIAIS AND METHODS

Presentation of the study area

The study area (Figure 1) is located in the National Park of El-Kala, located in northeastern Algeria and bounded on the east and southeast by Tunisia in the north by the Mediterranean Sea in the west and southwestern mountains Zitouna, the full El-Tarf and the dunes of Brihan.

The Park is a site of capital importance not only because of the mosaic of remarkable biotopes where endemic species, boreal and tropical, but also because it gathers alone a major part of the fauna and flora of the country. According to the climagram of Emberger (1955), the region is located in the bioclimatic Subhumid stage characterized by a cold and wet winter and a hot and dry summer.

Agro-silvo-pastoralism is the traditional system of livestock management in the region, of which natural grasslands are a part (MATALLAH ; ABBAS,2015).

Fig.1. Geographical location of the study region (BENYACOUB et al.; 1989) (with modification)



Experimental protocol

After conducting farmer surveys, ten (10) plots (natural grasslands) in three different regions (Table 1) were selected. These meadows provide pasture for livestock and receive no fertilization. The ecological parameters of the plots are presented in the following table.

Table1. Apparent ecological parameters of the plots studied

| Study zone | Rmel-Souk | Oued-El-Hout | Ain-Khiar |
|--------------------------|----------------------------|----------------------------|-----------------------|
| Geographical coordinates | 36°47'10" N 8° 32' 8" E | 33° 22'6" N 6° 52' 3" E | 36° 40' N 8° 20' E |
| Altitude | 115 m | 14 m | 25 m |

The parameters studied

Floristic richness (Number of families and species)

The floristic survey is carried out in a minimum area of 100 m² (10 m×10 m) per station over 5 repetitions. The quantitative measurements are carried out using the technique of aligned “quadrat points” (DAGET; POISSONET, 1971). This method involves extending a graduated tape 10 cm above the herbaceous vegetation with points equidistant from 10 cm. Using a needle, we note the frequency of the different elements (species, bare soil, etc.). In each survey, two lines of 10 are positioned on the diagonals of the study area.

This statement is supplemented by an exhaustive inventory of plant species on each course. The phytosociological surveys were carried out according to the method of (BRAUN-BANQUET, 1951); quadrats of one square meter of 1m² were carried out at random, in the middle of each plot. The vegetation surveys were carried out during the spring season.

Chemical composition of plant cover

It consists of cutting the plant material flush with the ground in 1 m² squares with 10 replicates per unit. Forage samples were dried with 60° for chemical composition (dry matter, mineral matter, crude protein and crude cellulose) according to (ABDELGUERFI; ET HAKIMI, 1990) methods.

Statistic study

Results are presented as mean ± standard deviation. Data were subjected to one-way analysis of variance (ANOVA).

3 RESULTS AND DISCUSSION

Floristic richness

Table 2. The floristic richness of the meadows studied in each region

| Genus and species | Family | Rmel-Souk (15 espèces) | Oued-El-Hout (11 espèces) | Ain-Khiar (07 espèces) |
|-------------------------------|----------------|----------------------------|-------------------------------|---------------------------|
| <i>Filago pygmaea</i> | Asteraceae. | + | + | + |
| <i>Mentha pulegium</i> | Lamiacées | + | - | - |
| <i>Lysimachia foemina</i> | Primulaceae | + | + | - |
| <i>Elymus repens</i> | Poacées | + | + | + |
| <i>Avena sterilis</i> | Poacées | + | + | - |
| <i>Plantago-lanceolata</i> | Plantaginacée. | + | + | - |
| <i>Malva sylvestris</i> | Malvacées. | + | + | - |
| <i>Trifolium tomentosum</i> | Fabaceae | + | + | + |
| <i>Lapsana communis</i> | Astéracées | + | - | - |
| <i>Euphorbia helioscopala</i> | Euphorbiaceae | + | - | - |
| <i>Lactuca serriola L</i> | Astéracées | + | + | - |
| <i>Medicago sativa</i> | Fabaceae | + | + | + |
| <i>Plantago major</i> | Plantaginacées | + | - | - |
| <i>Leucanthemum vulgare</i> | Asteraceae | + | + | - |
| <i>Vicia hirsute</i> | Fabacées | + | - | - |
| <i>Ranunculus repens L</i> | Ranunculaceae | - | - | + |
| <i>Hedysarum coronarium</i> | Fabaceae | - | - | + |
| <i>Cerinth major</i> | Boraginaceae | - | - | + |
| <i>Taraxacum</i> | Asteracea | - | + | - |

+: species observed in the surveys; -: species not observed in the surveys

The phytosociological surveys carried out in the spring made it possible to identify 19 plant species (table 2). The number of species is lower (between 7 and 15) than in the floodplains of the extreme North-East of Algeria (between 12 and 26) (ARBOUCHE et al.; 2009.) and in the permanent grasslands located in the same region (24 species) (MEBIROUK-BOUDECHICHE et al.; 2010). The floristic diversity of permanent grasslands in Europe varies from 15 to 100 species per permanent grassland (PLANTUREUX et al.; 1993; TORNAMBÉ et al.; 2010) with averages

reaching 30 to 60 species (JEANGROS; SCHMID, 1991). At the level of the R. Souk region, there is a richer floristic composition compared to the other regions with 15 species distributed in families whose grasses are the least represented (13%), (table 3) however it is characterized by the presence of certain plants, (*Mentha pulegium*, *Lapsana communis*, *Euphorbia helioscopala*, *Plantago major*, *Vicia hirsute*). The presence of the "Other families" category is also remarkable in this region (40%). The three regions do not follow the laws classically described for grasslands (ITAB, 2001, namely a predominance of grasses (presence of 50 to 70% of good grasses) followed by legumes.

Table 3. Composition of botanical families in the regions studied

| Contribution % | Rmel-Souk | Oued-El-Hout | Ain-Khiar |
|----------------|-----------|--------------|-----------|
| Legumes | 20% | 18% | 43% |
| Grasses | 13% | 18% | 14% |
| Composed | 27% | 37% | 14% |
| Others | 40% | 27% | 29% |

According to (09), the floristic composition of a good pasture should be close to 20 to 25% in legumes, 65 to 75% in grasses and 5 to 10% in various plants. A more balanced mixture of grasses, legumes and various forages (15, 17) increases the digestible energy content of the forage and the quantity ingested. However, it is necessary to point out the richness of the Ain Khiar region in legumes (43%),

According to (DUTHIL, 1967), the botanical composition of forages differs from one area to another depending on the environment (soil composition, altitude) This imbalance observed between species can also be explained by traditional extensive grazing throughout the year, lack of fertilization and maintenance. Tearing of certain plants by the teeth and excessive trampling can lead to a delay in the resumption of growth or even total degradation of the plants. Thus the species such as *Elymus repens*, *Ranunculus repens* and *Plantago major* indicates a problem of soil compaction (LISAN, 2016). At the time of vegetation sampling, gaps in the canopy (areas where grass is non-existent) were observed in the Oued El-Hout region.

Chemical composition

The three regions differ significantly by the contents of DM, MM, CC and CP. The highest average levels of MM and CP are recorded in the Ain-Khiar region (24, 6±5, 26: Table 4). This is probably linked to its richness in legumes. The latter are rich in protein as well as calcium and phosphorus (MENIGER,2017). The CP content of legumes grown and harvested in Algeria ranges from 15 to 25% of the DM (CHIBANI, 2013, in mixture with other species, the content of 14.32% of the mixture we obtain in the region of Ain -Kiar is acceptable. Nevertheless, it would have been

desirable for the chemical composition to be carried out for each of the species present on the meadow. In the absence of nitrogen fertilization, the CP content of the grass depends first and foremost on the supply of nitrogen by the soil and more locally on the restitution of nitrogen by animal excreta (DELABY, 2000). The mineral content in the three regions remains high compared to the results obtained in Algeria by several researchers (21):14% DM, (3):9, 6%DM, (MEBIROUK-BOUDECHICHE et al.; 2010):13, 69%DM). The percentage of mineral matter varies according to the development and the mineral needs of the plant. It is linked to the nature of the soil and its fertilization potential.

Table 4. Chemical composition of the grasslands studied

| Chemical composition | Rmel -Souk | Oued.EL-Hout | Ain-Khiar |
|--------------------------|------------|--------------|-----------|
| DM % | 29,04±4,5 | 25,08±6,3 | 24,23±8,8 |
| MM (%DM) | 18,43± 8,6 | 17,4±1,9 | 24,6±5,26 |
| CP (%DM) | 11.18±4,6 | 10.58±4,2 | 14.32± |
| CC (%DM) | 8.0±2,7 | 22±2,3 | 10±2,3 |
| *:Significant (P < 0.05) | | | |

4 CONCLUSION

This work provides interesting information on the floristic and nutritive composition of this agro-system of natural grasslands which occupies an important place in the study region. Today, because the management of grasslands is not known, an update seems necessary. Permanent grasslands still remain a regional asset to be developed and an important resource for ruminant breeding. We suggest a few ways to manage natural meadows to have good quality grass in sufficient quantity:

- Maintenance of meadows (weeding, fertilization) in order to promote the density of the herbaceous cover in order to avoid the appearance of undesirable species;
- Reduce the grazing load, especially during wet periods;
- Change the location of the pasture each year so as to maintain quality flora and floristic diversity;
- Practice mowing which will select large species (large grasses, umbelliferae, etc.) and will allow the presence of a "high" cover in the spring.

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