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Forage and pasture legume biodiversity in the semi-arid areas of West Central Morocco

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Summary - Morocco is one of the Mediterranean countries known for their native pasture legume biodiversity. However, successive droughts, continuous overgrazing, and some cultural practices such as weeding have contributed to the increase of erosion of the genetic resources of the native pasture legumes. In parallel to such genetic erosion there are only few efforts to save *in situ* seed production of these species. The objectives of this study were to assess the actual situation of the pasture legume biodiversity in cropland of semi-arid and arid areas of western Morocco and to examine their distribution according to rainfall and soil pH. The germplasm collection covered a total distance of 1000 km with high variability in rainfall and soil conditions. Ten native forage and pasture legume genera were identified in this collection. The dominant genera were *Medicago*, *Trifolium*, and *Astragalus* with 10, 7 and 4 species, respectively. Total number of species identified varied significantly between collection sites. Rainfall and soil pH affected legumes presence and distribution. Number of species varied from 12 in the northern sites with high rainfall to less than 2 in the southern arid sites. Sites having alkaline soils were more frequent and represented 60% of total prospected sites. Biodiversity of pasture legumes was limited more on shallow overgrazed soils or in areas where herbicides are used. The most frequent species is *Medicago polymorpha* followed by *Scorpiurus vermiculata*, also, *Medicago laciniata* is quite frequent. More focused and detailed monitoring studies of pasture legumes are needed to assess the evolution of natural germplasm erosion in order to be able to target the rehabilitation of heavily damaged sites.

Key-words: legumes, biodiversity, arid land, pastures, genetic erosion

Résumé - Le Maroc est l'un des pays méditerranéens connus pour leur diversité phylogénétique. Les sécheresses successives, le surpâturage et les pratiques culturales comme le désherbage contribuent à l'accélération de l'érosion des légumineuses pastorales et fourragères en particulier. En parallèle à cette situation peu d'efforts sont déployés pour produire et sauvegarder les semences de ces espèces. Les objectifs de cette étude sont de définir l'état actuel de la biodiversité des légumineuses pastorales et fourragères et d'examiner leurs distribution sur les terrains agricoles des zones semi-arides et arides. La collecte du germoplasme a été effectuée sur un transect de 1000 km avec des différentes conditions de sols, du climat et de pratiques culturales. Dix genres de légumineuses pastorales ont été identifiés. Les genres le plus dominant sont *Medicago*, *Trifolium* et *Astragalus*. Le nombre total des espèces collectées a varié de 12 espèces/site au Nord jusqu'à 2 espèces/site au Sud. Le climat et le pH du sol ont affecté la distribution des espèces rencontrées. La biodiversité génétique a été très limitée sur les sols dégradés et sur les champs où le désherbage est pratiqué. Les espèces les plus fréquentes sont *Medicago polymorpha*, *Scorpiurus vermiculata* suivis de *M. laciniata*.

Mots-clés: légumineuses pastorales, biodiversité, pâturages, érosion phylogénétique

Introduction

Morocco is one of the Mediterranean countries known for their native pasture legume diversity. Many studies on the ecology and distribution of native forage and pasture species were published (Foury, 1954; Nègre 1962; Allkin *et al.*; 1983; Bounejmate, 1992). However, many factors had contributed to the increase of the genetic erosion of native pasture legumes

like the successive droughts the country has known, continuous overgrazing, cultural practices such as manual or chemical weed control. Targeted surveys were conducted in West Central Morocco for seed collection of certain genera such as *Medicago*, *Vicia*, *Lupinus* and *Lathyrus* (Derkaoui, 1984; Francis *et al.*, 1994, Bounejmate *et al.*, 1994). No recent surveys were conducted to collect all encountered native legumes in crop lands to assess the actual legume biodiversity according to rainfall and soil pH distributions in addition to cultural practices. The objectives of this work were: i.) to identify all encountered forage and pasture legume species that exist in 1000 km transect made between Moulay Bouazza in the north and Chichawa and Safi in the south through the middle Atlantic plains and plateau of Morocco, and ii.) to study their distribution primarily according to rainfall and soil pH.

Materials and Methods

This survey was conducted in May 1997, in the semi-arid areas of West Central Morocco. A transect of 1000 km was made between Moulay Bouazza with an average rainfall of 450 mm/year to Chichawa and Safi provinces south with less than 180 mm/year. The geographic sites covered by the study were the central and phosphate plateau, the Chaouia plain, Beni Miskine plateau, Tadla, Rhamna, Abda and Haouz plains and Jbilet of Rhamna and Haouz, in addition to El Bhira of Benguerir. Stops, sampling methods and prospection techniques were chosen according to the classical sampling approach of Marshall and Brown (1971). Collection sites varied from deep clay soil cropland to shallow sandy and rocky cropland. Also a variation of soil pH, cropping and farming systems were encountered in the collection transect. Sufficient seed and soil samples were taken from each site for identification and pH measurements. An altimeter was used to record the altitude of each site. Total number of species was recorded for each site as well as all the agro-ecological passport data registered according to the international IBPGR standards. Collected forage seeds are stored for long and medium term storage at the seed bank of the INRA National Forage Crops Research Program headquarters in Rabat.

Results and discussions

The climatic conditions (rainfall and temperatures) of the previous growing season and also those of the collection year were favorable to native pasture and forage legumes species growth and seed production. Therefore results of this seed collection are significant and can be used as an indicator in the assessment of our cropland wealth and biodiversity of native forage legume species.

Ten native forage and pasture legume genera were identified in this collection. The dominant ones were *Medicago* with 10 species, *Trifolium* with 7 species, and *Astragalus* with 4 species. Each species is given a number to be referred to in the figures of the following sections. Total number of species identified varied significantly between collection sites. For example, on one hand, no legume species was found in site 9 which is an alkaline sodic soil, but on the other hand, more than 8 species were collected in sites 1, 3, 4, and 15 that were cropland with moderate grazing and with less weeding. Collection sites were ranged according to the number of species found. Therefore three biodiversity classes are identified:

- Above 8 species found per collection site. these sites are considered to be rich and well diversified sites. This kind of sites represent about 20% of the total prospected sites
- Between 4 and 8 species. These sites represent 40% of the total prospected sites.
- Less than 4 species. These sites are very heavily grazed or have soil quality problems (saline or acid). They represent 40% of total prospected sites.

Narrow genetic biodiversity of our pastures is well shown on sites with 8 or less species per site. These results show, therefore, the need to take measures and actions for saving and improving *in situ* our native legumes' genetic resources.

As it was mentioned before, soil pH varied between sites; this affected kinds and numbers of species encountered at each site. Hereafter we will give a short description of the number of species according to soil pH.

Total number of species in sites having neutral soils: Sites having a neutral pH represented 20% of prospected locations. The number of species varied from 12 in the Northern sites (Moulaye Bouazza area) with more favorable rainfall to less than 2 in the southern sites with less rainfall (El Bahira area). This fact indicates therefore that genetic erosion is more severe under unfavorable soil and rainfall conditions in addition to overgrazing and lack of protection measures.

Total number of species in sites having acidic soils: Prospected locations having acidic soils represented 20% of total collection sites. The total number of legume species were low and did not exceed 9 species per site. The interactions between soil acidity, low rainfall and overgrazing limited the forage legumes biodiversity. These low rainfall acidic soils that are neglected in agricultural research and development programs need to be considered in the future to improve their feed production and quality.

Total number of species in sites having alkaline soils: These locations are more frequent and represent 60% of total prospected sites. The number of species varied from nine species in Chemaiya cropland to nil in the site near Klaa Esraghna. Genetic biodiversity of pasture legumes is more limited on shallow overgrazed soils or in areas where herbicides are frequently used.

Frequency of forage and pasture legume species: Species such as: *Coronilla scorpioides*, *Medicago laciniata*, *M. polymorpha*, *M. truncatula*, *Scorpiurus vermiculata* and *Trifolium tomentosum* are adapted to a wide range of soil pH. The others are either specific to one or two kind of soil pH. Among species that are specific to neutral soils are: *Astragalus baeticus*, *Medicago rigidula*, *Trifolium stellatum*. Species that are specific to acidic soils were: *Lupinus hirsutus*, *Medicago litoralis*, *Trifolium arvense*, and *T. campestre*. Species that are adapted only to alkaline soils are: *Astragalus solindrii*, *Lotus tetragonolobus*, and *Trigonella arabica*.

Conclusions

The variability of the agro-ecological conditions found in Morocco made this country a very important source of collection of various legume species in the past, today and still in the future. Many seed collection missions were organized in the country by scientists from different parts of the World (USA, Australia, Japan, France, England, Spain, ICARDA, etc...) either to be used in research projects or to be stored in long term germplasm units for future use. This study, however, shows the alarming importance of the phylogenetic erosion of pasture and forage legumes that is taking place in Morocco. Therefore, there is a urgent need to study the assessment and the monitoring of this genetic erosion in order to store and rehabilitate these kind of useful species among others.

References

- Allkin, R., Bisby F.A, and White R. J. (1983). The geographical distribution of the *Vicieae*. University of Southampton, *Vicieae Database Project. Report # 5*.
- Bounejmate, M. (1992). Soil and climatic factors affecting the natural distribution of *Medicago* species in Morocco. *Ph D Thesis* University of Western Australia.
- Derkaoui, M., Caddel J.L., Roman, L.L. (1991). Seed production and reseeded of mediterranean annual *Medicago* Spp. in the southern great plains of the USA. *Agr. Med.*, Vol. 121, P:219-223.
- Foury, A. (1954). Les légumineuses fouragères au Maroc. *Cahier de la Recherche Agronomique* No 5. Service de la Recherche Agronomique, Rabat.
- Francis, C. M., Bounejmate M., Robertson L. D. (1994). Observations on the distribution and ecology of *Vicia* and *Lathyrus* species in Northern Morocco. *Al Awamia* No 84,. p: 17-27.
- Marshall, D.R., and Brown, A. H. D. (1971). Optimum sampling strategies in genetic conservation. In '*Crop Genetic Resources for Today and Tomorrow*'. (Frankel, O. M. and J. G. Hawkes, eds). Cambridge University Press.
- Negre, R. (1962). *Petite Flore des Régions Arides du Maroc Occidental*. Tomes I et II. Editions du Centre National de la Recherche Scientifique.