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Research Article

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Contribution to the lichens biodiversity in the forest of Imouzzer Marmoucha (Middle Atlas Pleated of Morocco)

Abdelkrim AJAJ, Amina OUAZZANI TOUHAMI, Rachid BENKIRANE and Allal DOUIRA*

Laboratoire de Botanique et de Protection des Plantes, Université Ibn Tofail, Faculté des Sciences,
P. O. Box 133, 14000, Kénitra, Morocco
*Corresponding Author E-mail: douiraallal@hotmail.com

ABSTRACT

A study of the lichen vegetation in the Moroccan pleated Middle Atlas, particularly in the Imouzzer Marmoucha forest allowed us to make an inventory of ten lichens: Anaptychia ciliaris, Evernia prunastri, Lecanora muralis, letharia vulpina, Parmelina pastillifera, Physcia adscendens, Physcia tenella, Pseudevernia fiurfuracea, Ramalina fraxinea, and Xanthoria parietina. The Lecanorales order is represented by nine species and the Teloschistales order is represented by one species.

Keywords*: Biodiversity, lichen, Pleated Middle Atlas, Imouzzer Marmoucha forest.*

INTRODUCTION

The lichens are present in many terrestrial ecosystems, they take an important part in the biodiversity of our natural environments through the many forms they have and the variety of environmental conditions they prefer.

Compared to other circum-Mediterranean countries, Morocco offers an original climate and orography, which correspond to original flora and vegetation[2].

The study of lichens in Morocco has been launched by Müller Argoviensis (1879, 1883). Thus, Since 1924, many important contributions on this subject have been published, Braun-Blanquet & Wilczek (1923) , Braun-Blanquet & Mayor[4], Mayor (1924), Bouly de Lesdain[3] and Emberger & Mayor[8], Egea[7], but these studies did not cover the entire country, although the number of species inventoried in Morocco is 1211 taxon among which 411 species collected in the Middle Atlas, Ajaj, A.[1]. However, this flora is far to be known, several important areas have not been surveyed by the expert botanists or barely touched too fast during excursions.

This research aims to study the lichens in the pleated Middle Atlas, particularly in the Imouzzer Marmoucha forest, which offers good conditions for their vegetation characterized by many species.

Environment Study

The Imouzzer Marmoucha Forest covers a total area of 22538 hectares divided into 132 plots. Due to its geomorphological and ecological heterogeneity, this forest contains a diversity of tree species grouped into three formations (*Cedrus atantica*: 16.8%, *Quercus rotundifolia* 70.8% and 12.4% of secondary species) (C.R.I.A, 1986).

Fig. Location map of the Imouzzer Marmoucha forest

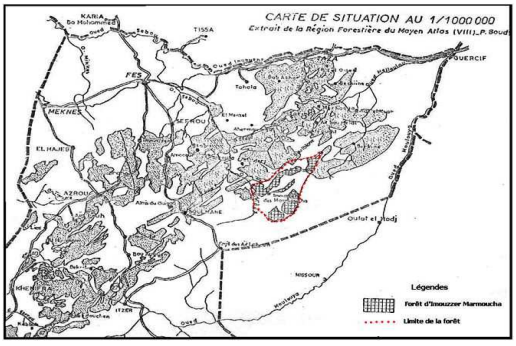

Fig. 2: General view of the Imouzzer Marmoucha forest : *Cedrus atlantica* et *Quecus rotundifolia*

The study area has a cold and damp climate, characterized by heavy snowfall in winter. Annual rainfall varies, going over 1400 mm in the mountains of Tazzeka south of Taza, 300 mm in the north-eastern end of the chain (Bou Rached)[11]. Snowfall can occur between October and May on the highest peaks of the region[10].

The rainfall pattern is maximal in November-December and March-April and minimal in July- August. Snow whose heights are not known in the Middle Atlas pleated covers the tops from 1400 or 1800 m between November and May and can occur even in the middle valley of Moulouya.

The Middle Atlas Pleated, which is part of the Maroccan Middle Atlas present in all low temperatures: in Immouzer Marmoucha, the maximum and minimum annual average respectively are 18.6 and 5.5 ° C, the temperature can drop below zero. In general, the study area has relatively moderate temperatures due to the altitude effect. The warmest months of the year are July and August, while the lowest temperatures are recorded in January and December.

MATERIALS AND METHODS

The collected species are conserved in strong paper envelopes allowing their transportation and conservation to their final ranking, after determination. Dry lichens are often very fragile, it is interesting to dry and flatten them slightly, this will facilitate their classification. The drying of the material is simply made by evaporation, optionally with a hot air source.

Each envelope shall bear a number of harvest, location, geographic coordinates, specific habitat, harvest date. The habitat will be described in sufficient detail, in particular the identity of the tree or shrub, exposure and slope of the substrate, and any other information that will allow a clear view of the ecological niche of the harvested species.

Macroscopic identification of the harvested species is made in the field by observing the distinctive macroscopic characters, namely the type and color of the thallus, presence or absence of macroscopic vegetative (isidia and sorlies.) and reproductive organs (apothecia, perithecia.) as well as the use of reagents in laboratory.

The species determination requires knowledge of the lichens organs structure. For this purpose we are equipped with a stereoscopic microscope for the observation of the whole body and obiously an optical microscope to view the microscopic structure of specimens. Thin sections were carried out using a razor blade in a shaking thallus portion between a longitudinal section in a piece of polystyrene. These sections are mounted in a drop of water between slide and cover slip and the observation is performed under optical microscope at a magnification of ×400. Sometimes the blue cotton is used to visualize the structures.

The thallines color reactions usually bring essential informations for accurate determination of species. The main reactants: potassium hydroxide 10% (K) and sodium hypochlorite (C). The reagent was introduced, with a slender matchstick on the upper cortex or medulla already freed with a razor blade. The results of these color reactions are rated C +, K + and the name of the color obtained (eg cortex K + red if a red color is obtained after filing of potash on the cortex) or C-, K- if the color does not change. KC reaction means that you must first put K then C immediately.

RESULTS AND DISCUSSION

In this study, 10 species belonging to nine genera were identified *Anaptychia, Evernia, Letharia, Parmelia, Physcia, Pseudevernia, Lecanora, Ramalina* and *Xanthoria* (Table 1.). These genera belong to five families: Physciaceae (1 case) Parmeliaceae (6 species), Lecanoraceae (1 case) Ramalinaceae (1 species) and Teloschistaceae (1 species). The order of Lecanorales is represented by 9 species and Teloschistales by a single species. The habitat of most of the species inventoried in this study is the holm oak (*Quercus rotundifolia*) and Cade juniper (*Juniperus thurifera*) except *Lecanora muralis* (calcareous) and *Letharia vulpina* distinctive species of cedar forests (*Cedrus atlantica*).

Table 1: The inventoried species in the Imouzzer Marmoucha forest

Order	Family	Type	Species	Habitat
Lecanorale	Physciaceae	Anaptychia	*Anaptychia. ciliaris*	on *Quercus rotundifolia* and *Juniperus thurifera*
	Parmeliaceae	Evernia	*Evernia prunastri*	on *Quercus rotundifolia* and *Juniperus thurifera*
		Letharia	*Letharia vulpina*	on *Cedrus atlantica*
		Parmelina	*Parmelina pastillifera*	on *Quercus rotundifolia*
		Physcia	*Physcia adscendens*	on *Quercus rotundifolia*
			Physcia tenella	on *Quercus rotundifolia*
		Pseudevernia	*Pseudevernia furfuracea*	on Q*uercus rotundifolia* and *Juniperus thurifera*
	Lecanoraceae	Lecanora	*Lecanora muralis*	Calcareous rocks
	Ramalinaceae	Ramalina	*Ramalina fraxinea*	on *Quercus rotundifolia* and *Juniperus thurifera*
Teloschistale	Teloschistaceae	*Xanthoria*	*Xanthoria parietina*	on *Quercus rotundifolia* and *Juniperus thurifera*

Fig. 3 : ***Anaptychia ciliaris*** **on** ***Quercus rotundifolia***

Fig. 4 : ***Xanthoria parietina*** **on** ***Quercus rotundifolia***

Fig. 5: ***Letharia vulpina*** **on** ***Cedrus atlantica***

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