Comparison between phyllosphere components of the leaves of Pistacia lentiscus in two stations of the Wilaya of Medea (Cherrata and Tamezguida) in Algeria

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Comparison between phyllosphere components of the leaves of *Pistacia lentiscus* in two stations of the Wilaya of Medea (Cherrata and Tamezguida) in Algeria

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Abstract. The aerial part of plants, phyllosphere, is colonized by complex communities of microorganisms. The microorganisms of the phyllosphere influence many processes in ecosystems and play a non-negligible role in agronomic and environmental field but its origin remains unclear. Bacteria are numerically more important and can modify plant growth and suppress or stimulate tissue colonization and infection by pathogens. In this study we aimed to describe the differences between the fungal and bacterial communities, their compositions and their structures on the leaf surface area of *Pistacia lentiscus* so called mastic pistachio. The biodiversity indices were performed to determine the organization of microorganisms in their communities after their characterization and taxonomy. Our results showed that the composition and the number of microorganisms are correlated positively with the leaf area.

Keywords. Phyllosphere – *Pistacia lentiscus* – Leaf area – Biodiversity.

Comparaison entre composantes de la phyllosphère pour les feuilles de* Pistacia lentiscus *dans deux stations de la Wilaya de Médéa (Cherrata et Tamezguida) en Algérie

Résumé. *La partie aérienne des plantes, la phyllosphère, est colonisée par des communautés complexes de micro-organismes. Les micro-organismes de la phyllosphère influencent de nombreux processus dans les écosystèmes et jouent un rôle non négligeable dans le domaine agronomique et environnemental mais leur origine reste floue. Les bactéries sont numériquement plus importantes et peuvent modifier la croissance de la plante et supprimer ou stimuler la colonisation des tissus et l'infection par les pathogènes. Dans cette étude nous nous proposons de décrire les différences entre les communautés fongiques et bactériennes, leurs compositions et leurs structures sur la surface de la feuille de Pistacia lentiscus, appelé aussi arbre au mastic. Les indices de biodiversité ont été calculés pour déterminer l'organisation des micro-organismes dans leurs communautés après leur caractérisation et taxonomie. Nos résultats montrent que la composition et le nombre de micro-organismes sont positivement corrélés à la surface foliaire.*

Mots-clés. *Phyllosphère* – Pistacia lentiscus – *Surface foliaire* – *Biodiversité.*

I – Introduction

Phyllosphere is the habitat provided by the leaf of the plant for many microbial species such as pathogens, saprophytes or mutualistic microorganisms. So this microbial compartment influences the dynamics and structure of plant communities. Although the phyllosphere composition was determined in some species, its origin remains unclear (Compant *et al.*, 2010), it may be linked to genetics of the species (Cordier, 2012) everything that defines the phenotype such as essential oils

and phenols (Yadav *et al*., 2008). Also, climate variation could change the structure and assembly of these microorganisms. In this structure, Bacteria are numerical majority along with the Archaea and Fungi. These microorganisms influence many processes in ecosystems and play an important role in agronomical and environmental perspectives (Compant *et al.*, 2010).

The mastic tree, also called lentisc or *Pistacia lentiscus*, from Anacardiaceae family, is a sclerophyllous evergreen shrub, with strong odor of resin and a very slow growing (Munné-Bosch et Peñuelas, 2003 ; Belhadj, 2007). This species belongs to the *Eu-Lentiscus* section along with *P. weinmannifolia* and *P. saportae*. The leaves, 1.5-3 cm long, may last 2 years on the tree (Ain-Lhout *et al*., 2004), with winged rachis, paripinnate, 2-3 pair of leaflets. This shrub is widely distributed in the Mediterranean basin (Zohary, 1952). In Algeria, this species is widely present in the thermo-Mediterranean bioclimatic stage. The shrub, about 2 m in height, may reach higher size (Belhadj, 2007) when growing in protected and humid places (Munné-Bosch et Peñuelas, 2003).

The bacterial communities of lentisc phyllosphere have been studied, particularly in relation to the composition of the leaves on essential oils (Yadav *et al*., 2008), as well as the interaction of chemical factors with the microorganisms and their opposite reaction to the change of the ecosystem (Yadav *et al*., 2005). The size of epiphytic populations is defined by the profile and the chemical structure of the mastic leave; many bacterial colonies have adapted to the antimicrobial activity of essential oils, which are used as a source of carbon (Yadav *et al*., 2008). In this study, our interest has focused on the study of the phylloplane microorganisms of the lentisc tree, to find out the relationship between these communities and their environment (leaf).

II – Material and methods

The composition of the phyllosphere is compared according to the leaf area. Leaves (3 leaves from nine trees, nine trees per site) were sampled in two sites in the area of Medea (Cherrata and Tamezguida, called the Platrière) (Fig. 1). First of all, measurement of the leaf area of 27 leaflets, per site, was carried out through a Mesurim software.Secondly, we carried out the cultivation of microorganisms of the phylloplane of the 27 measured leaflets, in Petri dishes. Counting of the number of bacterial and fungal colonies was then performed. The data were then analyzed using the PAST software. Simpson and Shanon biodiversity indices were calculated as well as the correlations between the leaf area and the number of microorganisms to find out whether their organization within their communities were similar or not.

Fig. 1. Location of the study area.

III – Results and discussion

The bacteria species are numerically higher. The number of species for both bacterial and fungal is well correlated to the leaf surface, since the leaves were ranked from the largest to the smallest area. The number of microorganisms increases with the leaf surface (Fig. 2).

Concerning the biodiversity indices (Simpson and Shannon), both populations are well balanced on the leaf surface, communities are distributed homogeneously (Fig. 3 and Table 1).

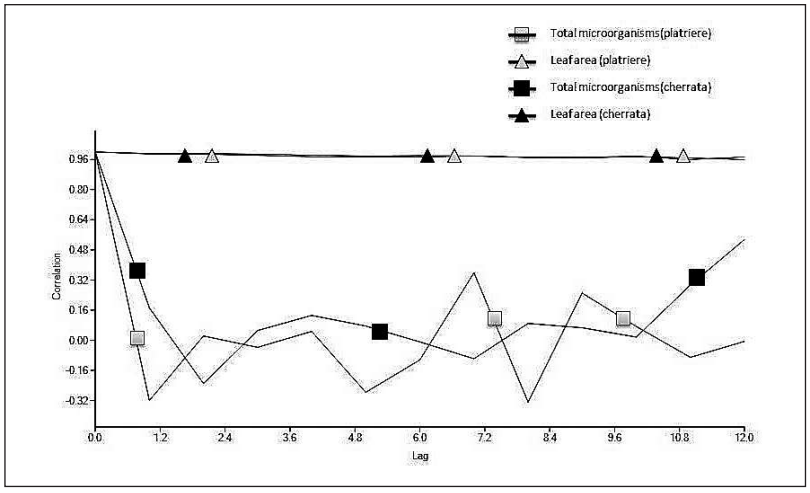

Fig. 2. Correlation between leaf area and total microorganisms from both sites.

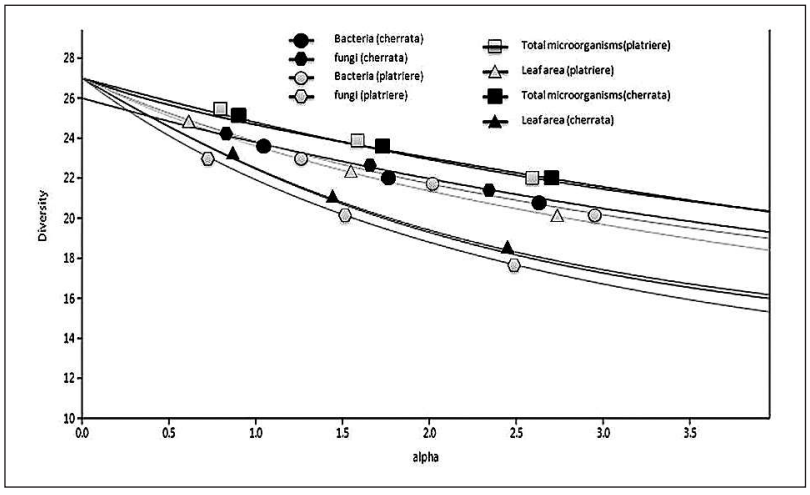

Fig. 3. Comparison of the diversity between the two sites over the leaf surface.

Table 1. Biodiversity indices calculated for both sites

	Bacterial colonies	Fungal colonies
Taxa_S	27	26
Individuals	193	112
Dominance_D	0.04771	0.04624
Simpson indice_1-D	0.9523	0.9538
Shanonindice_H	3.149	3.16
Evenness_e^H/S	0.8631	0.9068

IV – Conclusions

The organization of the phyllospheric components in *Pistacia lentiscus* leaves, their distribution and density is homogeneous. Bacteria are numerically higher than the fungi. The number of the colonies is correlated to the leaf surface.

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