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Hydration traits in epiphytic lichens of fragmented subcantabric *Quercus* forests

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INTRODUCTION

- Fragmentation and loss of habitat quality constitute a serious threat for biodiversity (Fahring, 2003). Consequently, functional traits are considered valuable tools for assessing the effect of forest disturbance on lichen diversity (Pinho *et al*., 2012).
- Functional traits are morpho and physiological traits with impact on growth, reproduction and survival of organisms (Violle *et al*., 2007). Epiphytic lichens present different functional strategies according to their growth form or type of photobiont (Benítez *et al*., 2018). Hydration traits may be also influenced by these factors and many others related with forest structure.
- We assessed if lichens with different growth forms and types of photobiont differed in their water holding capacity (WHC) and specific thallus mass (STM) in 10 subcantabric *Quercus* forests with different fragmentation level.

MATERIAL AND METHODS

❖ Study area

- The study area is located in the northwest of the Iberian Peninsula, below the Cantabrian mountain range (Fig.1). In this area, semi-deciduous *Quercus* forests are dominant and have been especially fragmented. We selected 10 forests with different sizes and shapes.

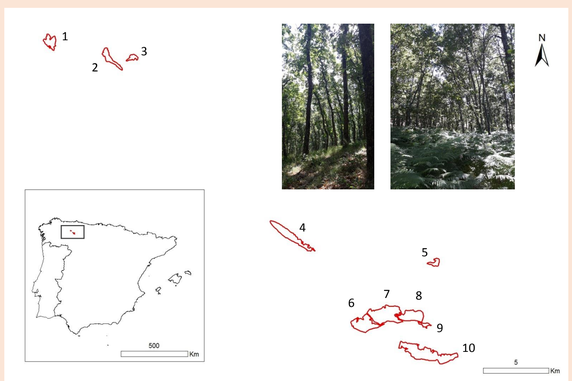

Fig. 1. Study area and forests selected

❖ Lichen samples

- Seven macrolichens species with different growth forms and types of photobiont were selected to accomplish the research (Fig.2). In each forest, five samples of each species were collected as long as they were present in the fragment.

- Growth forms
  - Foliose (A, B)
  - Fruticose (F, G)
  - Large foliose (C, D, E)

- Types of photobiont
  - Chlorophytaceous (A, B, F, G)
  - Cyanobacteria (C, D)
  - Chlorophytaceous + Cyanobacteria (E)

Fig. 2. Species selected. A (PSUL): *Parmelia sulcata* Taylor; B (PTIL): *Parmelina tiliacea* (Hoffm.) Hale; C (NRES): *Nephroma resupinatum* (L.) Ach.; D (LSCR): *Lobaria scrobiculata* (Scop.) P. Gaertn.; E (LPUL): *Lobaria pulmonaria* (L.) Hoffm.; F (EPRU): *Evernia prunastri* (L.) Ach.; G (RFAR): *Ramalina farinacea* (L.) Ach.

❖ WHC and STM traits

- In order to measure WHC and STM, 125 mg of each sample were cleaned and hydrated until saturation. Then, they were scanned and Area (A) of each image was recorded by Photoshop CS6 v13.0. Later, they were again moistened to measure wet mass (WM). After 48h of air-drying, samples were dried for 72h at 63 ºC and weighed to obtain dry mass (DM) (Merinero *et al*., 2014 with some modifications).

$$STM = DM/A \qquad WHC = (WM-DM)/A$$

❖ Data analysis

- ANOVA and Tukey HSD Test were used to test differences in WHC and STM among species, types of photobiont and growth forms. Linear regressions were used in the same way to test differences in relation with fragmentation variables. R Studio 3.5.2 was used to perform all analysis.

RESULTS

❖ Differences among species

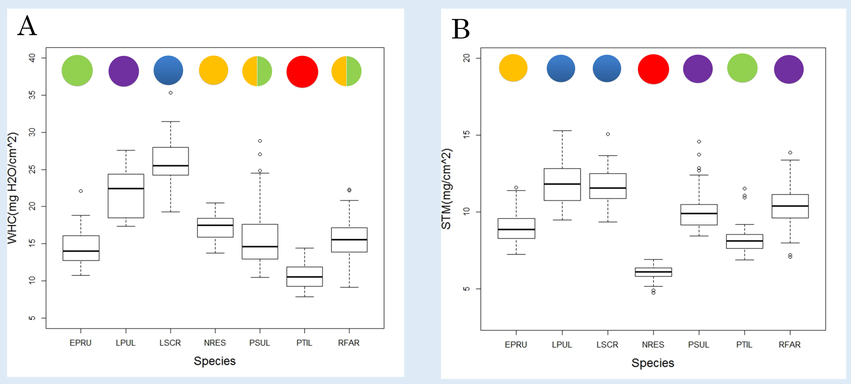

Fig. 3. A) WHC and B) STM differences among species. Tukey test groups are represented by different colours ($p<0.05$).

❖ Differences among types of photobiont

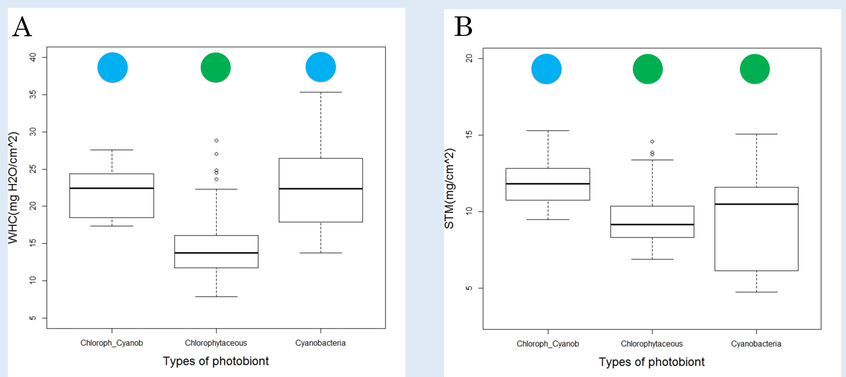

Fig. 4. A) WHC and B) STM differences among types of photobiont. Tukey test groups are represented by different colours ($p<0.05$). Key: Chloroph_Cyanob (Chlorophytaceous + Cyanobacteria).

❖ Differences among growth forms

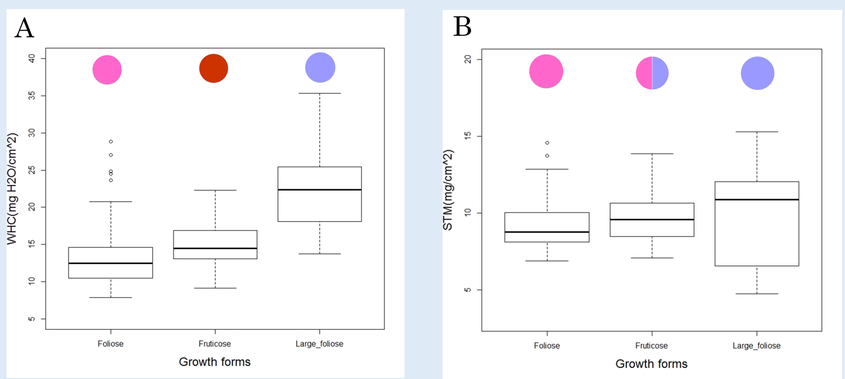

Fig. 5. A) WHC and B) STM differences among growth forms. Tukey test groups are represented by different colours ($p<0.05$).

❖ WHC relation with fragmentation variables

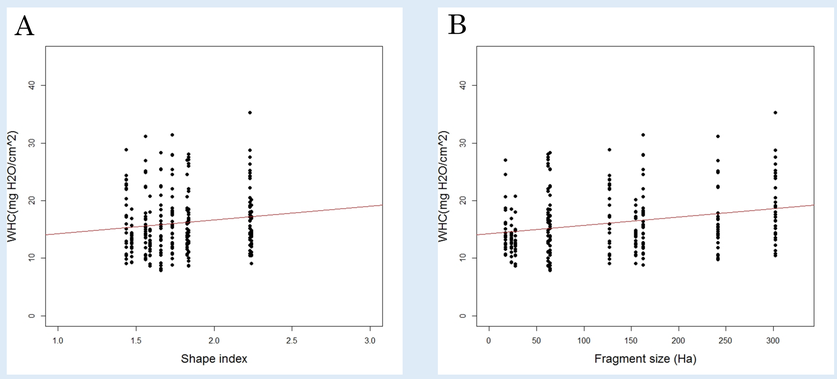

Fig. 6. WHC relation with A) fragment shape index and B) fragment size ($p<0.05$).

CONCLUSIONS

- *L.scrobiculata* showed the highest WHC and also the highest STM together with *L.pulmonaria*. The lowest WHC and STM was performed by *P.tiliacea* and *N.resupinatum*, respectively.
- Lichens with cyanobacteria as the main or secondary photobiont presented higher WHC than chlorolichens, while the highest STM corresponded to cephalolichens.
- Large foliose lichens exhibited higher WHC and STM followed by fruticose and foliose lichens.
- Variables related with forest structure (fragment size and shape index) affected positively lichens WHC, while no statistical differences were detected in STM. WHC was higher in larger and more irregular fragments.

REFERENCES & ACKNOWLEDGEMENTS

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