ABSTRACT OF RECENT PhD DISSERTATIONS

EFFECTS OF ULTRAVIOLET RADIATION ON BRYOPHYTES: FROM THE GENES TO THE FIELD

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Bryophytes were the first plant involved in the conquest of land. Thus, they had to adapt to higher levels of ultraviolet (UV) radiation, together with other factors differing from the aquatic environment. These organisms, in spite of their structural simplicity in comparison with vascular plants, have shown a notable tolerance against UV radiation. The responses of extant bryophytes to this stimulus may help explain how the first plants could cope with the new UV regime in the water-to-land transition. In this Thesis, these responses were studied at different scales, from a molecular level in the laboratory to an ecophysiological point of view under natural conditions. In addition, a great variety of methods were used to evaluate these responses among different species within this phylogenetic group, with particular attention to the corresponding model species of each of the three divisions: Physcomitrella patens for mosses, Marchantia polymorpha for liverworts and Anthoceros agrestis for hornworts. This main aim was divided in several more specific ones, which have been resolved in each chapter of the Thesis:

1- To study the UV-B photoreceptor protein (UVR8), and its possible importance in land colonization, in the main two groups of bryophytes, mosses and liverworts.

2- To evaluate the responses of UV-absorbing compounds (UVAC) to UV in six bryophytes differing in their taxonomical and structural characteristics.

3- To study the influence of the developmental stage of the liverwort Marchantia polymorpha in UVAC accumulation.

4- To characterize the responses of Marchantia polymorpha to photosynthetic, UV-A and UV-B radiation, using both molecular and physiological variables.

5- To study, under field conditions, the acclimation modalities of taxonomically and structurally diverse bryophytes to sun and shade conditions.

6- To evaluate, for the first time, the responses of the model hornwort Anthoceros agrestis to UV radiation under laboratory conditions.

From the results obtained in this study, it can be concluded:

- In relation with objective 1, both the moss Physcomitrella patens and the liverwort Marchantia polymorpha express functional UVR8 proteins, which are UV-B photoreceptors. Despite some differences in the structure and localisation, the function of this protein is strongly conserved over evolution.

- In relation with objective 2, responses of UVAC accumulation depended on the type of bryophyte, the species, the specific compound and the localisation within the cell.

- In relation with objective 3, the youngest samples of Marchantia polymorpha were the most UV-responsive ones in relation with the accumulation of UVACs. The responsiveness decreased as thallus age progressed.

- In relation with objective 4, Marchantia polymorpha responded especially to UV-B wavelengths, showing different responses such as an increase in sclerophylly, overexpression of chalcone synthase, and UVAC accumulation.

- In relation with objective 5, Marchantia polymorpha was the most plastic and radiation responsive species among the three studied. Sun plants showed higher contents of UVAC (both global and individual), higher schlerophylly and changes in photosynthetic variables in comparison with shade plants.

- In relation with objective 6, although no significant differences were found in the UVACs of Anthoceros agrestis in response to UV radiation, an increasing trend was found in all of them. Diverse causes, such as thalli age or experimental conditions, may affect this response.