

## VIABILITY OF DORADILLA MICROSPORES (*SELAGINELLA LEPIDOPHYLLA*, HOOK. & GROW.) UNDER EXTREME CONDITIONS OF TEMPERATURE AND UV RADIATION ANALOGUE TO MARS

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A study of the microspores of the extremophytic plant *Selaginella lepidophylla* using scanning microscopy techniques, as well as their exposure to UV radiation, is presented. This study is of great interest to the field of Astrobiology. We found that the microspores remained without structural modifications. This is the first detailed study of the microspores of this species.

The species *Selaginella lepidophylla* is a poikilohydric extremophyte that inhabits the arid deserts of North America and some arid places in central Mexico, like Puebla and Tlaxcala. It belongs to the Selaginellaceae family and it is frequently named “Doradilla”, “Stone Flower”, “Always Alive”, “Rose of Jericho” (false), and “Resurrection Plant”. This plant is quickly affected by the availability of water; in response to water stress, cells synthesize cryptobiotic substances such as trehalose (Adams et al. 1990). The rosette arrangement of the stems allows one to bend them, as the liquid is lost, until they form a compact sphere. The reduction of the available area for the incidence of solar radiation preserves the photosynthetic pigments. This process allows it to regain its photosynthetic competence very fast, so it can survive for a long period of time in a state of desiccation (Lebkuecher et al. 1993). Due to this behaviour, this plant manages to survive periods of droughts, high temperatures, and prolonged exposure to UV radiation. This motivated us to study the viability of *Selaginella lepidophylla* microspores under two extreme conditions analog to Mars in the Astrobiology Laboratory of UNAM.

In the first part of the experiment, a microspores sample has been extracted and identified through various staining and fixation techniques, as well as light microscopic observation. In the second part, the samples were subjected to UVC radiation (200–

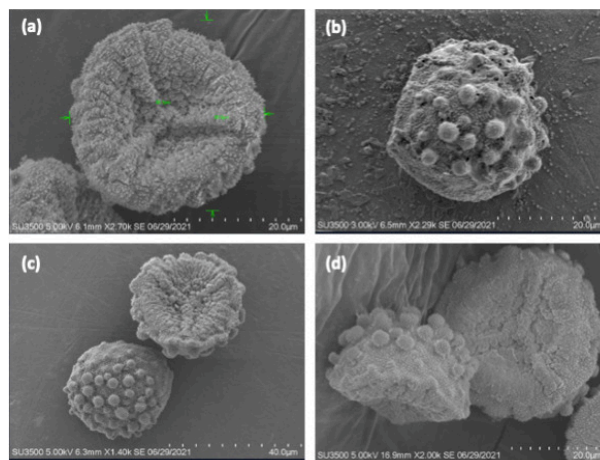


Fig. 1. Electron Scanning Microscope images of *S. lepidophylla* microspores. (a) Dehydrated control sample. (b) Hydrous control sample. (c) Low temperature sample ( $-75^{\circ}\text{C}$  during 21 days). (d) UV radiated sample (200–400 nm).

280 nm) and low temperature ( $-75^{\circ}\text{C}$ ) that would be found on the Martian surface. The fundamental objective of this project is to analyze and determine if *Selaginella lepidophylla* microspores behave as a potential astrobiological model for an interplanetary propagule of life form, supporting the theory of lithopanspermia (Reyes-Ruiz et al. 2012) and, in addition, contributing to the understanding of the limits of life under extreme climatic conditions.

The results obtained (Fig. 1) suggest that *S. lepidophylla* can be considered as a study model for Astrobiology due to the preservation of its structures and ornamentation after treatments.

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