Compatible solutes and metabolites accumulation does not explain partial desiccation tolerance in Hymenoglossum cruentum and Hymenophyllum dentatum (Hymenophyllaceae) two filmy ferns with contrasting vertical distribution

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Hymenoglossum cruentum (Cav.) Presl. and Hymenophyllum dentatum (Cav.) are poikilohydric partial desiccation tolerant (PDT) epiphytic filmy ferns with contrasting vertical distributions. H. cruentum is restricted to trunk base (ground to 1 m), and H. dentatum is more generalist growing from the ground up to 9 m in the host. Vertical distribution has been related to interspecific differences to cope with greater desiccating conditions such as low humidity and high irradiance. PDT plants exhibit a series of mechanisms that allow them to better tolerate severe dehydration that include the accumulation of compatible solutes, and the de novo synthesis of proteins and free sugars that are thought to protect cellular structure during cycles of desiccation-rehydration. Therefore, interspecific differences in the capacity to accumulate compatible solutes and metabolites during desiccation-rehydration may explain differences in vertical distribution between these two ?filmy fern? species. The contents of proline, glycine betaine, soluble sugars, total proteins, and pigments of the photosynthetic system were evaluated during a cycle of desiccation-rehydration in H. cruentum and H. dentatum. The latter exhibited a more rapid desiccation-rehydration cycle in contrast to the former. Soluble sugars, proline, and pigment contents decreased in the dehydrated state. The two filmy ferns did not exhibit a major accumulation of proline (lower than 8 ?mol g?1 DW) or glycine betaine (lower than 4 mg g?1 DW) which contrasts with other higher plants exposed to water deficit. Both species exhibited an elevated sugar concentration in the hydrated state, which

decreased during desiccation by approximately 2.5-fold. These results differ from previous studies on other desiccation tolerant higher-plants but agree with results from bryophytes. We concluded that accumulation of conventional compatible solutes of higher plants is not part of the dehydration induced mechanisms conferring desiccation tolerance in filmy ferns, and do not explain interspecific differences in vertical distribution of the two species. Therefore, partial desiccation tolerance of filmy ferns probably relies on preformed structural rather than induced biochemical mechanisms, suggesting similarities of Hymenophyllaceae (primitive ferns) with bryophytes.

Betaine

Partial desiccation tolerance

Photosynthetic pigments

Proline

Resurrection plants

Soluble sugars

amino acid

biochemical composition

chemical compound

dehydration

desiccation

epiphyte

fern

generalist

metabolite

photosynthesis

solute

sugar

tolerance

vertical distribution

bryophytes

Embryophyta

Filicophyta

Hymenoglossum cruentum

Hymenophyllaceae

Hymenophyllum

Selaginella pilifera