

Exploratory study of fatty acid profile in two filmy ferns with contrasting desiccation tolerance reveal the production of very long chain polyunsaturated omega-3 fatty acids

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Abstract

Lipids are fundamental components of cell membranes and play a significant role in their integrity and fluidity. Alteration in lipid composition of membranes has been reported to be a major response to abiotic environmental stresses. This work was focused on the characterization of frond lipid composition and membrane integrity during a desiccation–rehydration cycle of two filmy fern species with contrasting desiccation tolerance: *Hymenophyllum caudiculatum* (less tolerant) and *Hymenophyllum plicatum* (more tolerant). The relative water content decreased without differences between species when both filmy ferns were subjected to desiccation. However, *H. plicatum* reached a higher relative water content than *H. caudiculatum* after rehydration. Fatty acids profiles showed the presence of a very long chain polyunsaturated fatty acid during the desiccation–rehydration cycle, with eicosatrienoic acid being the most abundant. Additionally, propidium iodide permeation staining and confocal microscopy demonstrated that, following the desiccation–rehydration cycle, *H. plicatum* exhibited a greater membrane integrity than *H. caudiculatum*. The lack of some very long chain fatty acids such as C22:1n9 and C24:1n9 in this species contrasting with *H. plicatum* may be associated with its lower membrane stability during the desiccation–rehydration cycle. This report provides the first insight into the fatty acid composition and dynamics of the membrane integrity of filmy ferns during a desiccation–rehydration cycle. This could potentially play a role in determining the different levels of desiccation tolerance and microhabitat preferences exhibited by Hymenophyllaceae species.

Author keywords

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Fatty acid profile
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Hymenophyllum plicatum
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