Abstract

Aging is a universal phenomenon which affects all living organisms; a gradual degradation of form and function as the body succumbs to ever accumulating adverse changes. The skin is the largest and most superficial organ of the human body; as such it is exposed to external stressors which would increase the production of ROS, the primary actor of the aging process. As a response, the cell will activate stress-related signaling cascades which would cause changes in the expression level of genes such as *MMP1* and *COX2*; genes that contribute to the aging skin phenotype through collagen degradation and triggering cellular senescence, respectively. Antioxidants are commonly used to slow down the aging process as they inhibit the adverse effects of ROS. However there is a need to switch towards natural antioxidants due to the unsustainable nature and the potential adverse effects of synthetic antioxidants. *Marchantia paleacea* is a bryophyte common to Indonesia that possesses natural antioxidant capabilities, however the exact molecular mechanism of its anti-aging properties is still unclear. To investigate, cytotoxic and antioxidant assays, along with a cytoprotective study, as well as a gene expression analysis was performed on HaCaT cells under ROS-induced oxidative stress to assess whether or not *Marchantia paleacea* extracts would alter the expression levels of *MMP1* and *COX2*. *M. paleacea* extracts were found to possess cytotoxic activity against HaCaT cells. It was also discovered that the extract were capable of scavenging DPPH (2,2-diphenyl-1-picrylhydrazyl) radicals as well as protecting the HaCaT cells against H_2O_2 induced oxidative damage, hinting at its role as a versatile antioxidant. The extract however was not able to significantly influence the expression levels of *MMP1* and *COX2*, as such the extract could not be considered as an anti-aging agent through the alteration in the expression levels of the two genes.

Keywords: aging, ROS, antioxidants, *Marchantia paleacea*, gene expression analysis, *MMP1*, *COX2*