
Anthocyanins Isolated from *Hibiscus syriacus* L. Protect the Ultraviolet B-induced Damage to HaCaT Keratinocytes and Zebrafish Larvae Through Mitochondrial Reactive Oxygen Species Inhibition

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Hibiscus syriacus L. is the national flower of South Korea and is generally used as a traditional Asian medicine. In particular, Ethanol extraction of anthocyanins from the flower petals of *H. syriacus* L. variety Pulsae (PS) possess anti-septic shock, anti-oxidant, and anti-melanogenic properties. Several studies reported that ultraviolet B (UVB) radiation induced the overproduction of reactive oxygen species (ROS), which caused the degradation of extracellular matrix components of the skin by activating matrix metalloproteinases and keratinocyte apoptosis. Nevertheless, whether PS positively or negatively regulates UVB-mediated photoaging and photodamage is unknown. The HaCaT keratinocytes were treated with PS (0–400 µg/mL) and cultured for 2 h before (pre-PS treatment) or after (post-PS treatment) 30 mJ/cm² UVB irradiation. The zebrafish larvae were treated with PS for 2 h and then irradiated by UVB (150 mJ/cm²). UVB irradiation gradually reduced the survival rate of zebrafish larvae to approximately 60%-70%, and the survivors suffered from morphological abnormalities. However, PS restored the survival rate in a concentration-dependent manner without any abnormalities and the highest concentration of PS (200 µg/mL) resulted in a 100% survival rate of UVB-irradiated zebrafish larvae. PS also decreased UVB-induced excessive total intracellular ROS and mitochondrial ROS (mitoROS) production along with a decrease in the depolarization of the mitochondrial membrane potential. PS inhibited the expression of endoplasmic reticulum (ER) stress marker proteins, such as GRP78, p-eIF2 α , ATF4, and CHOP in UVB-irradiated HaCaT keratinocytes and suppressed ER stress-induced apoptosis, resulting in a decrease in mtROS production via the stabilization of the mitochondrial membrane potential. The results indicate that PS inhibits UVB-induced apoptosis by down-regulating total cytosolic ROS and ER-mediated mitoROS production in both HaCaT keratinocytes and zebrafish. The PS has potential to protect skin from UVB-induced photoaging and photodamage. The effect of PS against UVB-induced skin damage is clinically need to be evaluated.

Keywords: Endoplasmic reticulum, Hibiscus syriacus, Reactive oxygen species, Ultraviolet B