

Photoprotective effect of tomato extract rich in colorless carotenoids

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Abstract

Phytoene and phytofluene are the precursors of all other carotenoids, which possess diverse health-promotion effects [1]. Previous studies suggest that phytoene and phytofluene are effective in photoprotection, which might be attributed to their UV absorbing, antioxidant, and anti-inflammatory properties [2-4]. Therefore, the objective of this study is to explore the photoprotective effects of tomato extract rich in colorless carotenoids.

Ethanollic tomato extract was analyzed using HPLC, revealing high levels of phytoene (712 ± 34 $\mu\text{g/g}$ DW) and phytofluene (394 ± 20 $\mu\text{g/g}$ DW). Cytotoxicity assays demonstrated that both the extract and phytoene (1.56–100 $\mu\text{g/mL}$) were non-toxic to HaCaT and HDF cells. Pretreatment with tomato extract or phytoene significantly improved post-UV survival in HDF cells, although no comparable protection was observed in HaCaT cells. Cellular uptake of colorless carotenoids was confirmed in both cell types. Transcriptomic analysis further indicated that tomato extract might mitigate UV-induced damage by regulating cell cycle progression, activating p53-mediated DNA repair and apoptosis pathways, suppressing inflammation, and preserving cellular adhesion and structural integrity. Our findings may help to demystify the dietary supplements based on white tomato for skin whitening purposes.

References

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