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Anti-Aging Effects of Two Agricultural Plant Extracts and Their Underlying Mechanism

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Abstract : Chronic micro-inflammation is a hallmark of many aging-related neurodegenerative and metabolic syndrome-driven diseases. In high glucose (HG) environment, reactive oxygen species (ROS) is generated and the ROS induced inflammation, cytokines secretion, DNA damage, and cell cycle arrest to lead to cellular senescence. Water chestnut shell (WCS) is a plant hull which containing polyphenolic compounds and showed antioxidant and anticancer activities. Orchid, which containing a natural polysaccharide compound, possesses many physiological activities including anti-inflammatory and neuroprotective effects. These agricultural plants might be able to reduce oxidative stress and inflammation. This study was used HG-induced human normal dermal fibroblasts (HG-HNDFs) as an in vitro model to disclose the effects of water extract of Phalaenopsis orchid flower (WEPF) and ethanol extract of water chestnut shell (EEWCS) on the anti-aging and their underlying molecular mechanisms. The toxicity of extracts on human normal dermal fibroblasts (HNDFs) was determined by MTT method. The senescence of cells was assayed by β-galactosidase (SA-β-gal) kit. ROS and nitrate production was analyzed by Intracellular ROS contents and ELISA, respectively. Western blotting was used to detect the proteins in cells. The results showed that the exposure of HNDFs to HG (30 mM) for 72 h were caused cellular senescence and arrested cells at G0/G1 phase. Indeed, the treatment of HG-HNDFs with WEPF (200 μg/ml) and EEWCS (10 μg/ml) significantly released cell cycle arrest and promoted cell proliferation. The G1/S phase transition regulatory proteins such as protein retinoblastoma (pRb), p53, and $p16^{INK4a}$ depressed by WEPF and EEWCS were also observed. Additionally, the treatment of WEPF and EEWCS increased the activity of HO-1 through upregulating Nrf2 as well as decreased the ROS and NO of HG-HNDFs. Therefore, the senescence marker protein-30 (SMP30) in cells was diminished. In conclusion, the WEPF and EEWCS might inhibit HG-induced aging of HNDFs by reducing oxidative stress and free radicals.

Keywords : agricultural plant extract, anti-aging, high glucose, Phalaenopsis orchid flower, water chestnut shell
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