Abstract

Plant cells represent a valid source of cosmetic ingredients since their extracts can be considered bio-sustainable, contaminant-free and standardized secondary metabolites mixtures (Barbulova et al., 2014). This PhD project has met the interest of Arterra Bioscience S.p.A in performing a broad chemical and biological characterization of some plant cell extracts in the prospective to exploit them as cosmetic ingredients. In particular, we focused on the hydrophilic extract of *Oenothera biennis* cells (ObHEx) and on the hydroethanolic extract of *Jasminum sambac* cells (JasHEx). The mass spectrometry-based chemical characterization was performed using Global Natural Products Social Molecular Networking (GNPS)(M. Wang et al., 2016) as bioinformatics tool for data organization and annotation. The biological activity of the extracts was evaluated by a panel of *in vitro* (global proteomics analysis and cell-based assays) and *ex vivo* experiments.

Interesting secondary metabolites were identified in ObHEx: they belong to lignans (salvadoraside and liriodendrin) and triterpenes (myrianthic acid, arjunolic acid, asiatic acid and hederagenin), some of which previously associated with pro-collagen I production in human fibroblasts (Bonte et al., 1994; Farwick et al., 2014). Indeed, bioassays revealed that ObHEx is able, by increasing Myosin light chain kinase (MYLK) gene expression, to promote matrix collagen contraction, actin polymerization and the production of extracellular matrix proteins (Ceccacci et al., 2021). Moreover, global proteomics experiments, performed during my period as visiting PhD student at the Proteomics Platform of the INSERM US24, proved a pro-mitotic mechanism of action of ObHEx on senescent human dermal fibroblasts: it stimulates the re-entry into cell cycle of senescent cells via increase of mitotic protein expression (Ceccacci et al., 2022b).

JasHEx is principally composed by phenolic acid derivatives, lignans (secoisolariciresinol, nortrachelogenin and matairesinol) and triterpenes (arjunolic acid, asiatic acid, maslinic acid,

oleanolic acid and ursolic acid) (Ceccacci et al., 2022a). Biological experiments, carried out during my research period at Arterra Bioscience SpA, proved that JasHEx is able to reduce cytosolic reactive oxygen species production in stressed keratinocytes. It also showed anti-glycation activity and an extracellular matrix booster effect, by increasing collagen type I synthesis. In particular, the antioxidant properties of JasHEx were related not only to its free radical scavenging and metal chelating activities, but also to the enhancement of Nrf2/ARE pathway. This latter also explains JasHEx anti-inflammatory activity which decreased nitric oxide levels in LPS stimulated macrophages.

Thus, on the basis of these results, both extracts can be considered as powerful cosmetic bioactive ingredients to counteract skin aging.