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Editorial

Plants as an Inspiring Resource for New Bioactive Molecules in Skin Care and Treatment

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Plants exhibit a variety of properties, both medicinal in certain skin diseases and promoting skin health. They are a rich source of biologically active substances that have a significant effect on human skin, including macromolecules, polyphenols, carotenoids, tocopherols, terpenes, steroids, saponins, tannins, alkaloids, as well as components of volatile oils. Plant-derived chemicals display interesting properties (e.g. antioxidant, anti-inflammatory, anticancer, antimicrobial, immunomodulatory, UV-protective, melanin-inhibiting, astringent, regenerating, moisturizing, nourishing, capillary-stabilizing) that inspire the development of new drug and cosmetic formulations [1-3].

Macromolecules, such as bioactive peptides (specific protein fractions (sequence of 2–20 amino acids) and polysaccharides (high-molecular-weight polymers, composed of at least 10 monosaccharide molecules connected by glycosidic bonds), essential for cell proliferation and the growth and development of organisms, are also important skin health-promoting agents. They can regulate the redox state to slow ageing, protect skin cells, inhibit melanin production, and prevent lipid oxidation [2].

Polyphenols, organic chemical compounds containing two or more hydroxyl groups bound to an aromatic ring, commonly found in the plant world, have been described to exert many beneficial effects for skin, e.g. hydrating, smoothing, soothing and astringent, as well as accelerating the natural regeneration of the epidermis, stabilizing the capillaries, improving microcirculation and elasticity in the skin, and protecting against harmful external factors, including UV radiation. In recent decades, these diverse biological properties, have prompted the use of phenolic compounds (including flavonoids (flavonols, flavones, flavanols, flavanones, anthocyanidins, isoflavonoids)), phenolic acids (hydroxybenzoic and hydroxycinnamic acid),

tannins (hydrolysable and condensed (proanthocyanidins) tannins), as well as stilbenes (trans-resveratrol and its glucoside) as natural ingredients and additives in cosmetics, and pharmaceutical products [4,5].

Carotenoids (carotenes and xanthophylls), fat-soluble natural polyene pigments, having a conjugated system of double bonds, play as natural antioxidants that protect cellular lipids, proteins, and DNA from attack by free radicals. They prevent ageing, stimulate fibroblasts to produce collagen and elastin, inhibit the activity of MMPs, exhibit anti-inflammatory and UV-filtering effects, and improve skin elasticity, hydration and texture [2, 4].

Tocopherols and tocotrienols, molecules consist of a hydrophobic prenyl group that penetrates the cell membrane and a polar chromanol ring on the surface of the cell membrane, play key roles in protecting cellular membrane and are involved in various physiological and biochemical functions of the skin (e.g reduces the harmful collagen-destroying enzyme collagenase, inhibits tyrosinase, and also reduces skin roughness and the depth of wrinkles) [1,4].

Alkaloids are nitrogen-containing compounds found particularly in plants, which show diverse pharmaceutical activities. Because of the multi-direction properties, including antimicrobial (berberine, spilanthol), antioxidant (caffeine, berberine, spilanthol, capsaicin), anti-inflammatory (anatabine and piperine) or protecting against the harmful effects of UV (caffeine), these compounds can be used in the production of cosmetics and pharmaceutics [1,5].

Saponins, belonging to the group of non-volatile, high molecular weight compounds, may exhibit anticancer, antioxidant, anti-inflammatory or blood pressure-regulating properties. Steroid and triterpene sapogenins can have many differently located functional groups (hydroxyl, carboxyl, methyl), which enhances their differentiation. In the production of pharmaceutic and cosmetic preparations, both plant extracts and isolated single saponin compounds are used as active ingredients and as auxiliary substances [1,3,5].

Phytosterols (e.g. β-sitosterol, campesterol, stigmasterol, brassicasterol,) representing a diverse group of triterpenes, have significant roles in pharmaceuticals and cosmetics. These compounds are essential components of the cell membrane lipid bilayer. Such health-promoting effects of phytosterols as anticancer, antioxidative, anti-inflammatory, and antibacterial have been reported [1,5].

Essential oils are very complex mixtures of low molecular weight volatile compounds. Structurally, the chemical constituents of EOs can be classified into terpenes (compounds with simple hydrocarbon structures, e.g. pinene, myrcene, limonene, terpinene, p-cymene), terpenoids (oxygen-containing hydrocarbons, e.g. linalool, geraniol, thymol, carvone), phenylpropanoids (aromatic compounds, e.g. anethole, cinnamaldehyde, eugenol, isoeugenol, myristicin, safrole) and other constituents (e.g. derivatives of amino acids, polyketides, lipids, and sulfur derivatives). Among all chemical components, terpenes and terpenoids have been reported to play key roles in human health. Essential oils and their components are valued for their antiseptic, antimicrobial, antifungal, anti-inflammatory, immunostimulating, antioxidant, as well as anti-skin-ageing and tissue remodelling properties [2].

An important issue and main challenge for the pharmaceutical and cosmetic industries is to develop convenient, efficient and ecological methods for bioactive chemicals extraction and isolation from various plant sources. Technological progress in medicinal chemistry has already allowed the discovery of many plant-derived bioactive molecules. Undoubtedly, further research is needed to discover new molecules and their potential use in topical products as skin care and treatment agents [2,5].

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