WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Natural Antioxidant Used for Skin Care

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ABSTRACT

For millennia, natural ingredients have been utilized in skin care products. There is currently a continuous search for novel natural bioactives that not only support skin health but also shield the skin from disease-causing agents including free radicals and UV rays. Free radicals greatly contribute to skin damage and hasten aging by interfering with defense and restorative systems. Natural substances found in plants have the capacity to scavenge free radicals and have antioxidant qualities. The natural antioxidants utilized in skin care and skin aging with reactive oxygen species are the main topics of this review. Different plant species contain phenolic chemicals, carotenoids, and topoeroids that can protect the skin by blocking UV rays, lowering oxidative stress and inflammation, and affecting a number of survival signaling pathways.

Keywords: Antioxidants, skin, natural components, carotenoids, topoerids

Introduction:

One of the primary sources of materials utilized in the food, pharmaceutical, and cosmetics sectors is the plant kingdom. Many plant components used in cosmetics, nutricosmetics, and supplements have a long history of usage in traditional or folk medicine [1,2]. The skin is subjected to a variety of environmental stressors, varying in kind and severity, and there is insufficient evidence linking air pollution to skin conditions.With the notion that ultrafine particles may intensify the inflammatory process, harming the skin's surface or deeper, leading to dermatological disease, the few clinical evidence generally point to pollution exacerbating atopic dermatitis [3, 4]. The biggest living organ in the body, the skin shields the body from the external world by preserving the internal environment, preventing the entry of dangerous bacteria and chemicals, and blocking sunlight [5].

The stratum corneum, the skin's outermost layer, is a heterogeneous, selectively permeable epidermal layer that protects against environmental damage and dryness while maintaining enough moisture for proper function. [6]. Both free radical and non-radical species are included in reactive oxygen species (ROS). They could be created when an oxygen molecule undergoes partial reduction. Superoxide anion radical (O2 •−), hydrogen peroxide (H2O2), and hydroxyl radical (•OH) are the byproducts of reducing oxygen by one, two, and three electrons, respectively. Additionally, ROS comprise species such organic hydroperoxides (ROOH), peroxyl radicals (ROO•), alkoxyl radicals (RO•), and singlet oxygen (1O2). [7, 8, 9, 10] .The review's primary goal is to demonstrate that antioxidants, which are primarily utilized in cosmetics and anti-aging treatments, are safe for the skin and help to keep it healthy.

ANTIOXIDANTS:

Antioxidants are compounds that have the ability to oxidize either in place of or before other ones. They are the substance or mechanism that can engage with free radicals and halt the chain reaction before it damages essential molecules [11]. Your body is protected by antioxidants. They aid in preventing harm from unstable molecules known as free radicals. They are present in: * Foods: fruits, vegetables

* Cosmetics: Skin care goods

* Drugs: A few medications

They are employed for the following purposes:

* Food preservation;

* Skin protection; and * Health enhancement. [12]

Both natural and synthetic antioxidants are utilized in cosmetic products. [13] Because they are cheap to make, synthetic antioxidants like propyl gallate, butylated hydroxyanisole (BHA), and butylated hydroxytoluene (BHT) are frequently utilized [14]. However, studies indicate that consuming excessive

amounts of synthetic antioxidants may be harmful to one's health.As a result, natural antioxidants are becoming more and more popular. Because they believe that plant-based items, such as fruits and vegetables, are safer and have fewer negative consequences, they favor them. [15]

Antioxidants as Antagonists of ROS in Skin Disorders

The high concentration of harmful oxygen byproducts is a defining feature of the aerobic universe. The creature has developed an antioxidant mechanism to help them live in this harsh environment. "Any substances that are directly scavenges reactive oxygen species (ROS) or indirectly acts to regulate the antioxidant defenses or to inhibit ROS production" [16] is how Khlebnikov et al. described antioxidants. However, the capacity to create new, more stable radicals by intramolecular hydrogen bonding and accelerate their oxidation is another characteristic of antioxidants [17]. Furthermore, when antioxidants separate from their inhibitor, Kelch-like erythroid cell-derived protein 1 (Keap-1), they cause the nuclear factor-erythroid 2-related factor 2 (Nrf-2) to move from the cytosol to the nucleus by regulating gene expression. Nrf-2 can attach to antioxidant response elements (ARE) in the nucleus and trigger the transcription of genes involved in the stress response, including heme oxygenase-1 (HO-1), glutathione S-transferase (GST), and NAD(P)H: quinone acceptor oxidoreductase 1 (NQO1) [18, 19,20]. An interconnected network of various antioxidants that function at various degrees and through various processes makes up the cell's defense mechanism against oxidative stress. These are compiled in the table:

The first line defence		The second line defence		The third line defence	
Antioxidant	Mechanism of action	Antioxidant	Mechanism of action	De novo enzymes	Mechanism of action
Superoxide Dimultase	$O2 \bullet^{-} \rightarrow H2O2$	Ascorbic acid	Chain breaking: donate an electron to free radical	polymerase	DNA repair
Catalase	$2H2O2 \rightarrow O2 + H2O$	Uric acid		Glycosylases	
Glutathione peroxidase	$H2O2+GSH \rightarrow GSSG + H\ 2O$	Gluthione		Nucleases	
Transferrin	Metal chelators or sequester	α Tocopherol			
Caeruloplamin		Ubiqinol		proteinases	protein
		βCarotene	Incorporation of free radical	proteases	proteolysis
		Lycopene		peptidases	

Antioxidants can generally be divided into two categories: exogenous, or derived from the diet, and endogenous, or created by the body. There are two types of defenses in the first class: enzymatic and nonenzymatic. The first group consists of glutathione peroxidase, catalase, and superoxide dismutase (SOD) [21], while the nonenzymatic defenders include extracellular proteins that bind copper and iron (such as albumin, transferrin, lactoferrin, haptoglobin, and ceruloplasmin) and other cellular substances (such as quinones, glutathione, uric acid, and bilirubin) [22].

The Antioxidant Activity of Plants

Numerous physiologically active compounds found in plants have a major impact on human skin. Where a plant grows, when it is harvested, how it is treated after being picked, and the conditions under which the herbal material is dried and stored all affect how potent the plant is [24, 25]. Numerous characteristics of plants can be used to treat specific skin conditions and to promote skin health, notably through antioxidant actions [26, 23]. Antioxidants are the natural defenses found in plants. These consist of unique substances called polyphenols, vibrant hues like carotenoids, and vitamins like C and E. In addition to being components of essential oils, these antioxidants can also be beneficial to human health and aid in protecting plants from harm [27,26,28].

Polyphenols

The various biological activities of polyphenols are associated with their diversity in structure. Along with their anti-inflammatory, moisturizing, smoothing, calming, anti-aging, UV-protective, antibacterial, and capillary stabilizing qualities, polyphenolic chemicals also have a potent antioxidant impact [27,29,30,31,32].

Antioxidant-rich polyphenolic raw resources include oil seeds, fruits, vegetables, fruit juices, herbs, and spices. The body can also get phenolic chemicals from plant extracts as medications, nutritional supplements, nutricosmetics, or cosmetics [27, 29, 31]. Many skincare products contain plant chemicals called polyphenols. They function as antioxidants, preventing damage from dangerous chemicals and protecting skin cells. * Inflammation reduction: They soothe inflamed skin.

* Enhancing the appearance of skin: They can aid in moisturizing, whitening, and reducing wrinkles.

These substances must be liberated from the product and permeate the layers of the skin in order to be effective. Plant extracts containing this category of chemicals are widely used in many skin care products due to the positive benefits of polyphenols on the skin [29, 33].

Carotenoids

Plants and other photosynthetic creatures produce a type of tetraterpenoid pigments called carotenoids, which are fat-soluble. These conjugated polyenes have a distinctive chromophore that gives them their vivid yellow-to-red colors. They are categorized as xanthophylls (oxygenated derivatives) and carotenes (hydrocarbons), which act as accessory pigments in photosynthesis to aid in light harvesting. Notably, some carotenoids, like beta-carotene, have provitamin A activity and can be converted by the body into retinol [34].

Plants that contain natural carotenoids include carrots (e.g., α- and β-carotene and lycopene), chili peppers (capsorubin), tomatoes (β-carotene and lycopene), broccoli (βcarotene), spinach (neoxanthin), pumpkin (β-carotene, β-cryptoxanthin, lutein, and zeaxanthin), watermelon (lycopene, α-, β-, β-, and γ-carotene), papaya (βcarotene, and lycopene), sea buckthorn (α-, β-, γ-carotene, lycopene, lutein, and zeaxanthin), and dog rose (β-carotene,lutein, and lycopene).[35,36]

Tocopherols and Tocotrienols

The most potent form of vitamin E in humans is α-tochpherol [37]. It is thought that γ-tocopherol captures and neutralizes preexisting free radicals, whereas α-tocopherol mainly prevents the creation of new ones [38]. The human body uses vitamin E for a number of physiological and biochemical processes. It is a lipid-soluble antioxidant that stabilizes the membrane. Tocopherols are crucial for shielding cellular membranes against LPO caused by free radicals. Moreover, vitamin E aids in membrane repair by reducing the production of oxidized phospholipids. The inclusion of a hydroxyl group in the 6 hydroxychroman, which contributes a hydrogen atom to reduce free radicals, is one of the mechanisms by which tocopherols exhibit their antioxidant action [37, 38]. The antioxidant reaction results in the oxidized form of α-tocopherol, which can be decreased by ascorbic acid .Vitamin E's antioxidant qualities are crucial in preventing a number of illnesses, including cancer, atherosclerosis, cataracts, Alzheimer's disease, and cardiovascular disorders [38]. Importantly, vitamin E contributes to protection against skin cancer and photoaging. Vitamin E is remarkably abundant in the stratum corneum, the outermost layer of skin that protects against the damaging effects of OxS brought on by sunlight. The primary antioxidant in the human epidermis is α-tocopherol, and its depletion can be a more rapid and sensitive indicator of oxidative damage in the environment [39]. By preventing sun damage, skin acts as a shield, shielding the body from damaging UV radiation.Vitamin E helps repair any damage that has already occurred.

Conclusion

Nowadays, the most widely utilized ingredients in skin care products are plant extracts. This product group has the advantage of acting safely and effectively.Plant extracts are a vital class of multipurpose skin care products since they are a rich source of physiologically active compounds. It is generally recognized that they can improve the state and appearance of the skin and may be used to treat a number of skin conditions, such as atopic dermatitis and phototoxicity. Plant extracts have anti-inflammatory, antibacterial, emollient, melanin-inhibiting, antimutagenic, astringent, regenerative, moisturizing, capillary-stabilizing, cleaning, and UV-protective qualities. Plant extracts' biological activity is also linked to their ability to scavenge free radicals. .Antioxidants, such as plant extracts, can be used topically to assist the skin's natural defenses against oxidative damage caused by UVR and illnesses caused by OxS. A few studies assessing the effects of antioxidants derived from plants on skin are mentioned in the literature. The main anti-aging properties of curcumin, or turmeric, a component of Curcuma longa rhizome, were examined by Lima et al. Their in vitro research on healthy human skin fibroblasts demonstrated that curcumin triggers cellular stress responses via redox signaling and the phosphatidylinositol 3-kinase/Akt pathway (PI3k/Akt pathway), bolstering the idea that curcumin-induced cellular antioxidant defenses can be a useful antiaging treatment strategy. Since ancient times, plant-based products have been utilized to treat skin conditions. Natural components are still widely used today in a variety of creative and practical formulas for skin care, cleansing, and protection. For medicinal and cosmetic uses, both individual active chemicals and groups of compounds found in plants are utilized; these are often extracted from different plant parts and employed as the primary ingredients. Because they shield your skin from harm, maintain its youthful appearance, and help prevent skin cancer, plant extracts are beneficial for your skin.Antioxidants found in these natural extracts protect your skin from UV damage, battle harmful chemicals that damage it, and make you appear younger and healthier.These beneficial plant extracts include tomato, grape seed, and green tea. You can use these extracts in skincare products, take them as supplements, or eat foods rich in them.

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