Available online on 15.06.2024 at http://ajprd.com

Asian Journal of Pharmaceutical Research and Development

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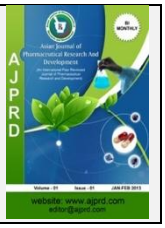

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Review Article

Skin Aging and Herbal Anti-Aging Serums: A Comprehensive Review

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A B S T R A C T

This review explores the intricate anatomy of the skin, giving a brief synopsis of its structure and role. It describes the various aspects of skin aging and the roles that both intrinsic and extrinsic factors play in this process of aging. Focusing on the topic of herbal medicines, the article investigates the scientifically proven anti-aging properties of a variety of herbs. It also provides information about the composition and varieties of serums, emphasizing important components such hyaluronic acid, vitamin C, vitamin B3, and herbal extracts that are effective in preventing facial ageing. The aim of this review is to provide readers with a comprehensive understanding of skin aging and the wide range of anti-aging techniques accessible, especially in the context of herbal based face serum

Key words: Skin, Ageing, serums, anti-ageing, herbal extracts, Facial serum.

A R T I C L E I N F O: Received 10 Jan 2024; Review Complete 15 May 2024; Accepted 05 June 2024 ; Available online 15 June. 2024

Cite this article as:
Dileep SA, Dayanand NN, Redasani VK, Skin Aging and Herbal Anti-Aging Serums: A Comprehensive Review, Asian Journal of Pharmaceutical Research and Development. 2024; 12(3):208-213, DOI: http://dx.doi.org/10.22270/ajprd.v12i3.1415

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INTRODUCTION:

The skin serves as a barrier to protect the body's internal organs from the outside world[1].The epidermis, dermis, and subcutaneous tissue are the three layers that make up the skin [2]. The outer layer, known as the epidermis, is made up of a stratified, squamous epithelium that is mostly made up of keratinocytes and dendritic cells, which include Merkel, Langerhans, and melanocytes [3].

Skin structure and physiological function gradually deteriorate as a result of the complex, multifaceted phenomena known as aging, which is caused by both intrinsic and extrinsic parallel processes [3]. A person's smooth, pale, drier, less elastic skin with fine wrinkles is the hallmark of intrinsic skin aging, which is only noticeable in old age [5].

It is generally acknowledged that reactive oxygen species (ROS) and free radical reactions generate cumulative damage that leads to intrinsic aging [6]. A number of conditions, including ionizing radiation, extreme physical and mental stress, alcohol consumption, poor nutrition, overindulgence in food, pollution from the environment, and exposure to ultraviolet radiation (UVR), can cause extrinsic skin damage [7].

It is possible that topical skin therapies could slow down these changes in the skin and possibly even return it to its prior quality[8]. Since ancient times, the herbal preparations have been utilized to treat a variety of skin conditions due to their many therapeutic qualities.A harmonious synergy of bioactive components found in herbal substances, as opposed to synthetic ones, work together to enhance skin health. A number of herbal products are receiving a lot of attention in the skincare sector due to their discovery of therapeutic potential [9]. Among the constituents in the facial serum is a neuropeptide, which has been linked to improved barrier function and a reduction in the appearance of fine lines and wrinkles [10].

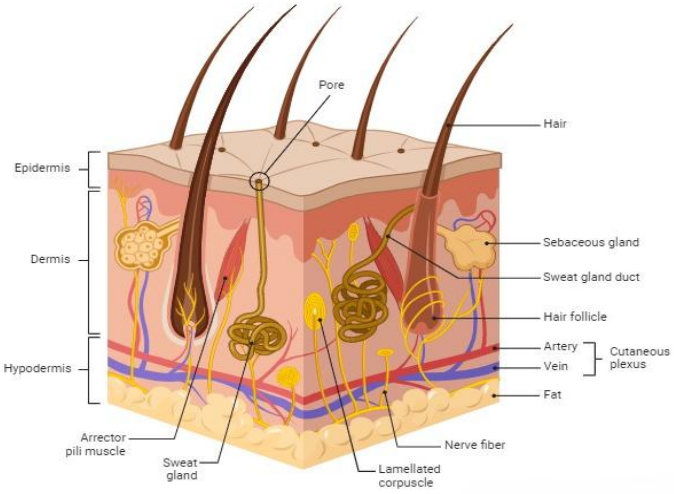
An essential factor in the aging of the skin is antioxidants. They are naturally occurring radical scavengers. Antioxidants are extremely beneficial for both preventing and improving aging and UV-damaged skin[11]. previous researchers had developed an anti-aging product using natural ingredients. A cosmetic preparation, serum offers the benefit of having a high concentration of active ingredient[12]. Plant-based active chemicals, such as flavonoidsare commonly employed in topical preparations due to their antioxidant capabilities [13].

The synthesis of anti-aging serum from plant extract has been studied in the past. Thus This review offers an update on skin

anatomy, a brief synopsis of skin aging that covers both intrinsic and extrinsic aging, and a list of various anti-aging herbs. It also explores an overview of serum, different kinds of serums used in skincare routines to prevent ageing, and essential components found in antiaging face serum.

Anatomy of skin:

In terms of both structure and function, the skin is a complicated organ. It assists by guarding against harmful germs, decreasing chemical penetration, and limiting losses of water and electrolytes. The epidermis, dermis, and hypodermis are the three layers that comprise the skin [14].



Structure of skin

1. Epidermis:

The epidermis, the outermost layer of skin, varies in thickness from 0.5 mm for the eyelid to 1.5 mm for the palms and soles. It is made up primarily of melanocytes and keratinocytes, which combine to form a binary system, and is created by a stratified squamous epithelial layer.[15]

2. Dermis :

The dermis is a thick layer of elastic, fibrous tissue that lies underneath the epidermis. The layer of connective tissue that sits between the subcutaneous and epidermis is called the dermis. The dermis is composed of ground substance, fibers, and cells since it is connective tissue. Fibroblasts are the cells that make collagen and elastin fibers. Up to 30% of the dermal volume and 75% of the dry weight are made up of collagen. [15][16]

3. Hypodermis:

The innermost, or subcutaneous, layer of skin is called the hypodermis. The hypodermis shields the skin, provides a reserve energy source, and permits mobility by gliding over underlying components. Adipocytes are the main constituents of the hypodermis, and they are arranged into lobules that are characterized by fibrous connective tissue[15].

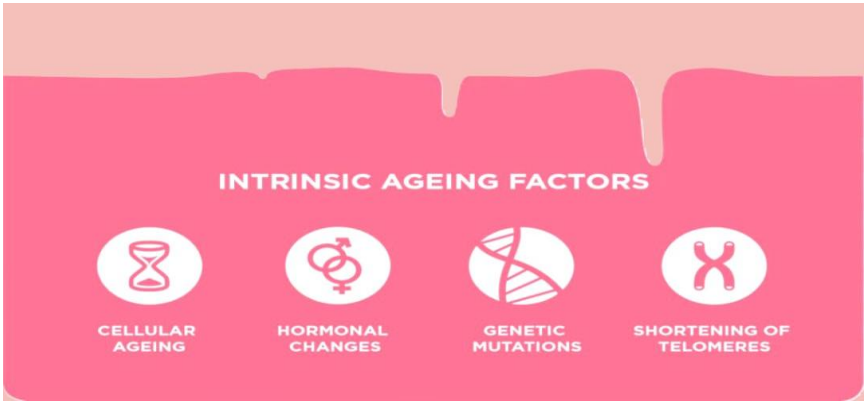
Overview on skin Aging

The main signs of aging skin include the appearance of wrinkles, uneven pigmentation, darkening, thinning, sagging, and roughening of the skin. Either intrinsic or extrinsic mechanisms could be responsible for this[17]. There are numerous theories that attempt to explain the aging process, but the most likely ones center on DNA damage and the accompanying repair process, which cause epigenetic changes throughout the genome that cause cell senescence, loss of proper cell function, and genomic aberrations[18].

Extrinsic aging is brought on by environmental factors like ultraviolet (UV) radiation and pollution and results in the production of reactive oxygen species. Intrinsic aging is linked to programmed aging and cellular senescence, which are caused by endogenous oxidative stress and cellular damage[19].

Intrinsic skin aging

It is a chronologically-driven physiological transformation process. Essentially, intrinsic skin aging is a condition that only appears in old age and is symbolized by smooth, unblemished, pale,dry, less elastic skin that has fine wrinkles[20].Intrinsic aging is characterized by a decline in dermal fibroblast count, which lowers the synthesis of collagen and elastin, especially types I and III collagen, and results in skin thinning, wrinkles, and loss of elasticity. [21].Skin aging is partly caused by increased expression of matrix metalloproteinases (MMPs), which break down collagen and elastin in the dermal skin layer. Antioxidants such as resveratrol and isoorientin can reduce its expression[22]. Both intrinsic and extrinsic variables can contribute to skin aging.[23].

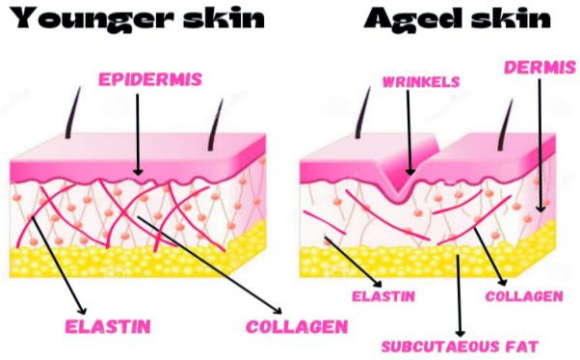


Intrinsic factor responsible for skin ageing

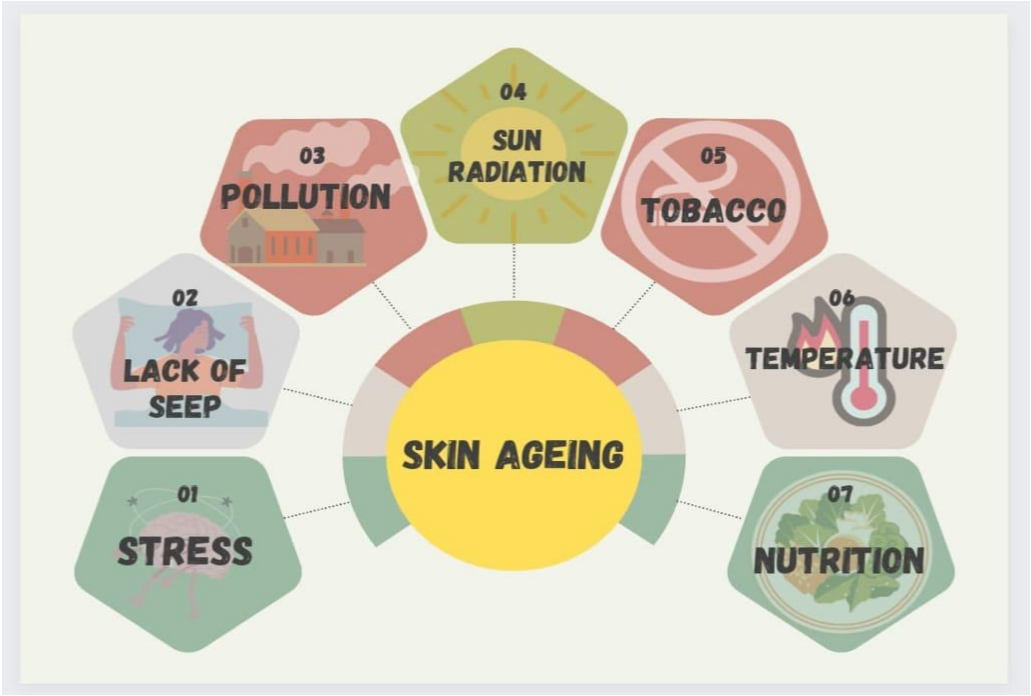
Extrinsic Skin aging

Low-grade chronic UVR exposure is responsible for over 80% of the aging process of facial skin, while exposure can also result in sunburn, tanning, inflammation, and damage to dermal connective tissue. Extrinsically aged skin, primarily from UVR rays, has sallow complexion with uneven pigmentation, rough texture, coarse wrinkles, and decreased skin elasticity[20].

Accelerated skin aging can be caused independently by long-term exposure to UV radiation and cigarette smoking. ROS produced by UV exposure lead to harmful oxidative stress. Because O2 can take electrons, it produces extremely reactive chemical compounds known as ROS[24].Reactive oxygen species (ROS) are produced when the skin is exposed to photoaging stimuli. These ROS subsequently stimulate dermal enzymes such as collagenase and elastase. These enzymes speed up premature skin aging by breaking down elastin and collagen, respectively. Signs of this process include deep furrows or severe atrophy, wrinkles, freckles, sallowness, laxity, and a leathery appearance[25].



Difference between young skin and aged skin



Extrinsic factors responsible for skin ageing

Antiaging Effect of Various Herbs:

In the pursuit of natural solutions for combating aging, traditional herbal medicine has emerged as a promising avenue. Herbs have long been revered for their potential to promote longevity and vitality, and modern research is increasingly validating these claims. Additionally, there are several herbs have been identified from various selected reports and researches studies showcasing there potential Antiaging activity some of them are mentioned in below table.

Table 1: Several selected reports and research on anti-aging activities of Traditional herbs

Scientific Name	Common name	Part	Solvent	Phytochemicals	Activity	Ref
Epilobium angustifolium L	Firewee-d	stem, leaves and flowers	70% (v/v) ethanol	Phenoloic acid, Gallic acid,	The antioxidant, anti-ageing, anti-inflammatory	[26]
Coffea arabica	Coffee plant	leaves	Methan-ol	chlorogenic acid, caffeic acid, phenols	prevention of photoaging	[27]
Azadirachta indica A.	Neem	Leaves	50 % ethanol	Rutin	preventing wrinkle formation, Antiaging	[28]
Hibiscus sabdariffa	Rosella	calyx	ethanol	Hibiscus acid	Antiaging	[29]
Ocimum sanctum Linn.	Queen of herb	Whole plant	Hexane	propanoic acid, apigenin, cirsimaritin,	Antiaging antioxidant	[30]

				isothymusin, isothymonin, carnosic acid, rosmarinic acid		
Glycine max	Black Soyabean	-	70% Ethanol	Daidzein flavonoids, isoflavones.	Antioxidant, Antiaging.	[31]
Syzygiumjambos L	Jamun	Leaves	Distilled water	Malic acid, Citric acid Gallic acid Kaempferol Quercetin	Antiaging anti-biofilm, antioxidant	[32]
Silybum marianum (L.)	milk thistle	Fruit	Aqueou-s Ethanol	silybins A isosilybins A Taxifolin	Antiaging Antioxidant	[33]
Centella asiatica	Gotu kola	-	90% Ethanol	Flavonoids Eugenol triterpenoids	Antiaging	[34]
Morous alba	Mullberry	fruit	50% Ethanol	flavonoids phenolic acids and anthocyanins	Antiaging, Antioxidant	[35]
Ginkgo biloba	ginkgo	Leaves	95% ethanol	Bilobalide Ginkgolide quercetin and kaempferol	Antiaging	[36]
Rosa damascena	Rose	petals	70% Ethanol	Flavonoids, terpenoids, phenolics, tannins, and alkaloids	Antiaging, anti-hyaluronidase.	[37]
Calendula officinalis	Marigold	flower	Water/Ethanol extract	Quercetin, Flavonoids	Protect against oxidative stress, Antioxidant	[38]
Mangifera indica L	Mango	Leaves	70% methan-ol	1,3,5,6-tetrahydroxyxanthone-C-4-β-D-glucopyranoside	Antiaging, anti-collagenase, anti-elastase, anti-hyaluronidase	[39]
Hylocereus polyrhizus	red pitaya	Fruit Peel	82% ethanol	_	Antiaging	[40]
Moringa olifera	Moringa	Leaves	90% ethanol	Apigenin 8-C-glucoside, Quinic acid, 3-Caffeoylquinic acid.	Antiaging, Anti wrinkle	[41]
Crocus sativus. L	Saffron	Stigmas	80% Ethanol	_	Antioxidant, antiaging	[42]
Camellia sinensis	green tea	seeds	70% ethanol	_	Prevention of skin photoaging and wrinkle formation	[43]

Serums:

In order to be faster and more effective than cream treatments, serum, also known as concentrate, contains 10 times more biologically active ingredients. Having the capacity to reach the skin's deeper layers, serum absorbs quickly. More bioactive ingredients are found in serum. Because serum has a lower viscosity than other moisturizers, it has the advantage of being more comfortable to apply and spreading more easily over the skin's surface[12].

Face serums are composed of minuscule molecules that facilitate rapid and deep skin penetration. Numerous beneficial nutrients and active ingredients, including ceramides, amino acids, and antioxidants, are abundant in serum. The facial serum has a number of components that are linked to a reduction in the visibility of fine lines.[44].

Antioxidant serums are a type of preparation that works to stop reactive oxygen species from oxidatively damaging tissues and cells. Wrinkles and fine lines can be prevented or minimized with the use of anti-aging serums[45].

Different Types of serum:

Oil type: Among the most basic face serums are oil serums. These oils provide skin-metabolizable substances like polyphenols and vital fatty acids, as well as moisturizing and barrier-repairing properties. They also include high-performing oil-soluble extracts and fragrance mixes containing healthy aromatic compounds. Oil serums fortify and moisturize the skin's protective layers.

The gel serum: Gel serums provide the skin a momentary tightening and lifting sensation. They use formulations that are based on water, which makes it possible to add hydrophilic botanical extracts. Glycerites and powdered botanicals can be used to color or make transparent gels.

Emulsion type: It is appropriate for preparations with high levels of oily components and UV absorber because this type has a high emollient content. In situations when repellent nature is required, the w/o type is appropriate.

Transparent Or semi – transparent Lotion type: often has a higher humectant content than lotion. A humectant and a

water-soluble polymer can be chosen, and their combination can be changed, to alter the texture[46].

Key Ingredients used in Antiaging face serum

Vitamin C: The most prevalent antioxidant in the skin is L-ascorbic acid, which is also the form of vitamin C that is physiologically active. Vitamin C is believed to have anti-aging properties and is necessary for the synthesis of collagen. [47]. It has been demonstrated that vitamin C guards against UV-induced immunosuppression and photoaging. By boosting collagen synthesis, maintaining collagen fiber stability, and reducing collagen breakdown, it also has an antiaging impact [48].Due to the lack of the enzyme L-glucono-gamma lactone oxidase, humans cannot produce vitamin C in vivo. Therefore, a balanced diet and enough nutritional intake of vitamin C are essential for human health. Several cosmetic products, including those for sun protection, skin whitening, and anti-aging, have been found to include L-ascorbic acid [49].

Hyaluronic Acid: One of the most popular macromolecules for treating skin aging is hyaluronic acid [50]. N-acetylglucosamine and D-glucuronic acid combine to form the disaccharide units that make up hyaluronic acid (HA), a polysaccharide that is a member of the glycosaminoglycan family. With its moisturizing and anti-aging properties, HA has several advantages over other chemicals used in skin regeneration [51]. Collagen and elastin fiber interfaces and their peripheries have been observed to contain HA, which helps to maintain the appropriate conformation of these two proteins. In both cosmetic and nutricosmetic products, HA has emerged as one of the most important components. HA is a component of almost all products with skin-protective, anti-aging, and moisturizing qualities [52].

Vitamin B3: The amide form of water-soluble vitamin B3 (nicotinic acid, niacin) is called nicotinamide or niacinamide. For many years, nicotinamide has been used in cosmetics to brighten skin tones and delay the aging process of the skin.[53]. Topical niacinamide treatment enhances the surface structure, minimizes wrinkles, and prevents the development of skin cancer. Furthermore, nicotinamide has been shown to promote keratinocyte differentiation and boost the skin's synthesis of ceramides and collagen, which enhances the skin's barrier function and attractiveness [54].Strong anti-aging ingredients like niacinamide neutralize free radicals and reactive oxygen species (ROS), shielding skin cells from oxidative harm. In addition to increasing the activity of enzymes like superoxide dismutase and catalase, it modulates enzymes like NADPH oxidase and nitric oxide synthase to lower the formation of reactive oxygen species (ROS). By promoting skin integrity and cellular health, these activities aid in delaying the onset of aging [55].

Herbal Extracts: It has been documented that a number of plant bioactive compounds interact with cellular signaling pathways that are either directly or indirectly responsible for the aging of the skin. Herbal products can be used topically to act as cosmetics for body care; bioactive molecules affect the skin's biological processes and supply the nutrients required for good skin health[56].Due to its considerable effect on skin aging, herbal cosmetics are becoming more and more popular nowadays, not just in Asian countries but also in other countries[57].Studies reveal that certain phytochemicals included in these herbs, such as flavonoids and polyphenols, are the most desirable class of substances due to their beneficial effects on human health and anti-aging properties[58].Phenolic substances include ferulic acid, vanillic acid, caffeic acid, chlorogenic acid, and gallic acid. And flavonoids such as epicatechin, rutin, myricetin, naringenin, kaempferol, quercetin, and myricetin. tannins such as ellagic acid and stilbenes such as resveratrol[59].

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