REVIEW


# ANTI-AGEING NATURAL HERBS: A SYSTEMIC REVIEW

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**ABSTRACT**: Skin is the largest organ of the integumentary system. The overall well-being& perception of health in humans, very much depends on skin health & beauty. Skin plays a vital role in immunity& protects the body against pathogens, maintains water and electrolyte balance & also regulates body temperature. Epidermis is the protective covering over the body surface which serves as a barrier to infection. Thinning of this epidermal layer, loosening of collagen & elastic fiber, leads to the wrinkle formation and causes ageing. Ageing occurs due to the intrinsic factors like genetics, cellular metabolism, hormone & metabolic process or extrinsic factors like sun exposure, smoking, diet and pollution. In this era of modern science, people choose natural herbs rather than plastic surgery or laser therapy for not only looking younger but also to reduce complications. Herbs help in biological functioning of the skin & supplies nutrients required for healthy skin. Herbs contain several phytochemicals like carotenoids, terpenoids, polyphenols which possesses anti-aging activity. A few herb which shows anti-aging activity includes, Aloe, Cucumber, Ginseng, Honey, Wheat, Liquorice, Arjuna, Jatamansi etc.

**KEYWORDS:** Herbs, Anti-aging, Skin, Phytochemicals

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**INTRODUCTION:**

Ageing is an unavoidable process for all living organisms. Ageing phenomena starts from the moment of our birth and is markedly visible on the skin in progressive years. Based on increased life expectancy, it is estimated that there will be over 1.2 billion older adults (over 60 years old) worldwide in 2025.[1] Ageing is at least partially attributed to an age related increase in weakness and immunosenscence and perhaps mitochondrial dysfunction.[2]

Maintenance of the physical function in older adults is therefore a major public and clinical priority. In humans the skin is the tissue most markedly affected. Skin is a protective barrier against the external environment. Its function is to regulate temperature, fluid balance & to protect from harmful microbes and UV radiation in sunlight. Two types of skin ageing exist: age-dependent/chronological ageing and premature ageing/photoageing. Photoageing is caused by extrinsic factors and includes signs such as a leathery appearance, dark/light pigmentation and deep furrows. Natural ageing is visible as wrinkling of the skin. The skin is divided into three layers; the epidermis, dermis and subcutaneous tissue.[3]

The extracellular matrix (ECM) is the outermost part of the skin and is composed of fibroblasts and proteins including collagen and elastin. After the age of 20, its symptoms appears as the collagen content per unit area starts decreasing, there is 1% decrease in collagen content per unit area of the skin every year. The ECM provides a structural supporting structure which is essential for growth and elasticity of the skin and plays an important role in the maintenance of physiological functions of the body. Degenaration of the ECM has directly been linked to skin ageing and is correlated with an increase in activity of certain enzymes involved in skin ageing, which includes hyaluronidase, elastase and collagenase. Collagen is one of the major building blocks of the skin, which is responsible for the elasticity and strength of the skin and maintains its flexibility. Hyaluronic acid performs a role in retaining the moisture of the skin, as well as its structure and elasticity. It also facilitates the exchange of nutrients and waste products and is participating in rapid tissue proliferation, regeneration and repair. With ageing, collagen, elastin and hyaluronic acid levels declines, leading to a loss of strength and flexibility in the skin which results in visible wrinkles associated with the thickened epidermis, mottled discoloration, laxity, dullness and roughness of the skin.[4]

Reactive oxygen species (ROS) play an important role in many cellular mechanism . When UV radiation is absorbed by the skin, it leads to enhanced ROS generation and induction of oxidative stress. Oxidative damage may lead to lipid peroxide formation, mitochondrial and DNA damage, and protein and gene modification which change protein structure and function. High levels of ROS lead to the activation of hyaluronidase, collagenase and elastase, which can further contribute to skin ageing.[5]

The enzyme angiotensin 2 also plays a vital role in photoaging of skin as it involved in healing wounds and scar formation, appearance of scars leads to wrinkles. So by using angiotensin converting enzyme (ACE) inhibitors which prevent the conversion of angiotensinogen (inactive) to angiotensin (active) we can decrease the effect of angiotensin 2 induced skin ageing and wrinkles.

The modern science and technology provides plastic surgery, laser rejuvenation, and many more invasive techniques. Noninvasive techniques do not involve any risks or complications and mostly free of side

effects as compared to the invasive techniques which are more painful and laborious. Over the last decade, there has been an increase in the use of herbal extracts in cosmetics to reduce the ageing process. The extracts of Aloe Vera, Amla, Turmeric, Cucumber, Ginseng, Honey, Wheat, Liquorice, Arjuna, Jatamansi are extensively used in herbal cosmetic industries due to their skin beneficial properties.[6]

## MECHANISM OF SKIN AGING

**Extrinsic skin ageing:-**

This is caused by environmental factors, such as exposure to the sun rays, repetitive facial expressions, gravity, sleeping positions and smoking.[7] Extrinsic ageing is caused by chronic exposure to UV light, so it is also known as photoageing.[8] Extrinsic skin ageing is a collective process and depends mostly on the degree of sun exposure and skin pigment. With chronic skin exposure to UV rays, the stratum corneum layer of skin thickens, the epidermis is damaged and there is progressive dysplasia with cellular atypia and anaplasia, reduction in collagen and degradation of elastic fibres.[9]

**a. Membrane/ nuclear signaling:-**

UV irradiation provokes reactive oxygen species (ROS) which repress the activity of enzyme protein tyrosine phosphatase κ. This enzyme maintains cell surface receptors of skin, including receptors for epidermal growth factor(EGF), interleukin (IL)-1, keratinocyte growth factor and tumour necrosis factor (TNF)-α in an inactive (hypophosphorylated) state.[10] Activated receptors impel to intracellular signaling through stimulation of the stress-associated mitrogen activated protein (MAP) kinases p38 and c-Jun amino terminal kinase (JNK). Kinase activation induces the transcription of MMPs (matrix metalloproteinase) and decreases expression of the procollagen I and III and TGF-β receptors, with afinal outcome of reduced dermal matrix formation and hence, it reduces the synthesis of collagen.[11]

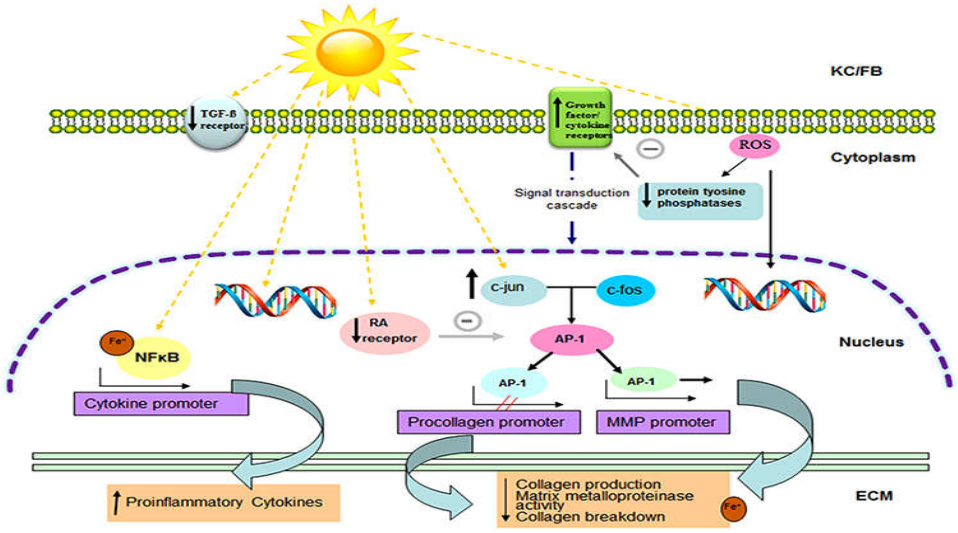


**Fig.1:** Nuclear Signaling

**b. Mitochondrial damage :-**

Mitochondria are cellular organelles that generate energy (ATP) by compelling oxygen. UV effect on the mitochondria electron transport chain produces abundant ROS that can damage mitochondrial DNA (mtDNA).The mitochondrial genome encodes 13 components of the electron transport chain and oxidative damage may be foremost to deletions or rearrangements of the DNA, most likely due to double-strand breaks which may affect mitochondrial ability to generate energy for the cell. It is inferred that the consequent decrease in mitochondrial function photodamaged skin leads to additional accumulation of ROS and further compromises the cell's ability to initiate energy.[12]

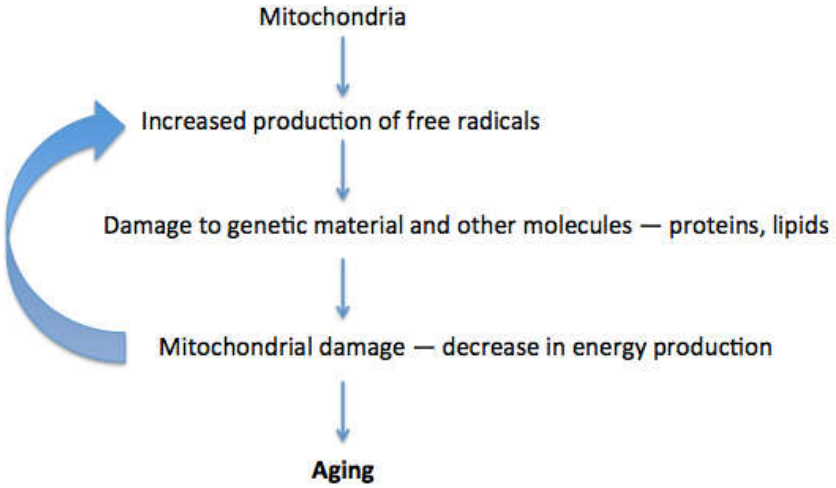


**Fig. 2:** Mitochondrial damage.

**c. Protein oxidation :-**

Oxidative damage can also affect proteins and photodamaged skin. Oxidative protein impair may result in loss or gain of activity (i.e. enzymes), loss of structural protein function and increased/decreased susceptibility to degradation.[13]

**d. Telomere :-**

Telomeres are tandem repeats of a short sequence TTAGGG. It exists in a loop configuration. Telomeres become critically short when these loop is disrupted by cell division or UV irradiation. During cell division telomeres cap (the terminal portion of chromosomes, preventing the fusion of telomeres with each other) cannot be replicated, so the bases of the telomeres caps are lost with each cell division and finally enters a state of senescence or apoptosis. When telomeres are damaged by UV irradiation the loops configuration becomes disclosed and through interaction with the protein activates the tumour suppressor protein p53 and other proteins which responsible for DNA damage and also induces senescence or apoptosis.[14]

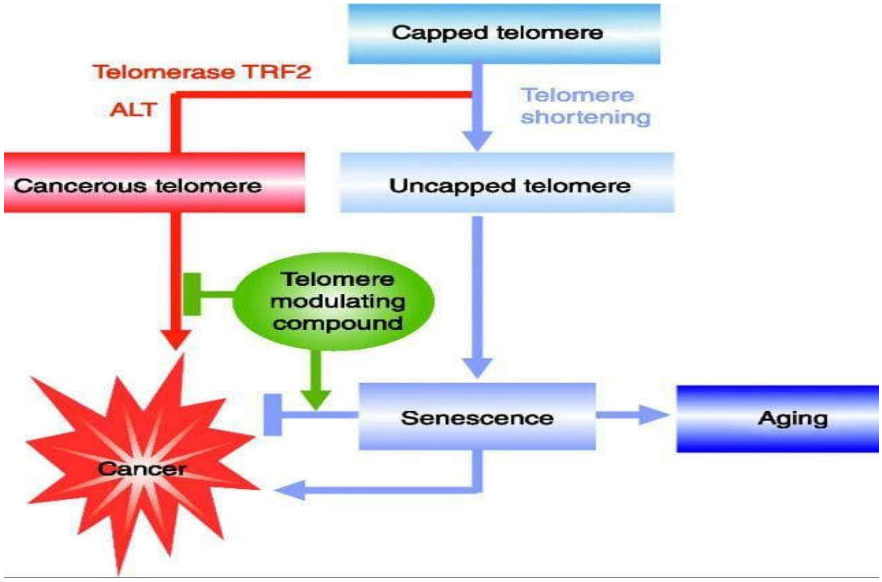


**Fig.3:** Telomerase induced skin aging

**Intrinsic skin ageing: -**

Intrinsic skin ageing, also known as natural ageing mostly found in sun protected area. It is due to the passage of time or by the inherited gene, therefore also termed as chronological ageing. Basically the molecular machanisms of both the type of skin ageing (extrinsic and intrinsic) are similar, for example shortening of telomeres, mutations of mitochondrial DNA, oxidative stress, genetic mutations and decrease of many hormone levels. According to the free radical theory of ageing, ROS, chiefly commencing from oxidative cell metabolism, play a notable role in both chronological ageing and photoageing. ROS influence the transcription factor c-Jun via MAPK (mitrogen activated protein kinase).Intrinsic skin ageing as same like extrinsic ageing and collagen is degraded present in intrinsically aged skin similar to photoaged skin.[12]

Hormonal changes can also alter intrinsic skin ageing. The exhibition of sex hormones in the gonads, the pituitary and adrenal glands already gradually decline in the mid-twenties. The hormone oestrogen and progesterone start decreasing during menopause. In particular, the imperfection in oestrogens and androgens cause dryness, wrinkling, epidermal atrophy, collagen breakdown and loss of elasticity.[15]

**NATURAL HERBS USED FOR ANTI-AGEING:-**

Herbal cosmetics play a leading role in impeding and reversing ageing of skin. Ingredients present in herbal cosmetics impact biological functions of skin and it also provide required nutrition for healthy skin. It has been estimated that more than 50% of all the drugs in the world are natural products and their derivatives, and plant-based health remedies are promising. The application of herbal anti ageing products has been proliferated to many folds in personal care practices. The recent trends in anti-ageing skin care products is focussed on developing new plant extracts and botanical ingredients based on their traditional medicinal uses which leads to the emergence of several cosmoceuticals that prevent wrinkles and protect the skin from any kind of unwanted symptoms.[17]

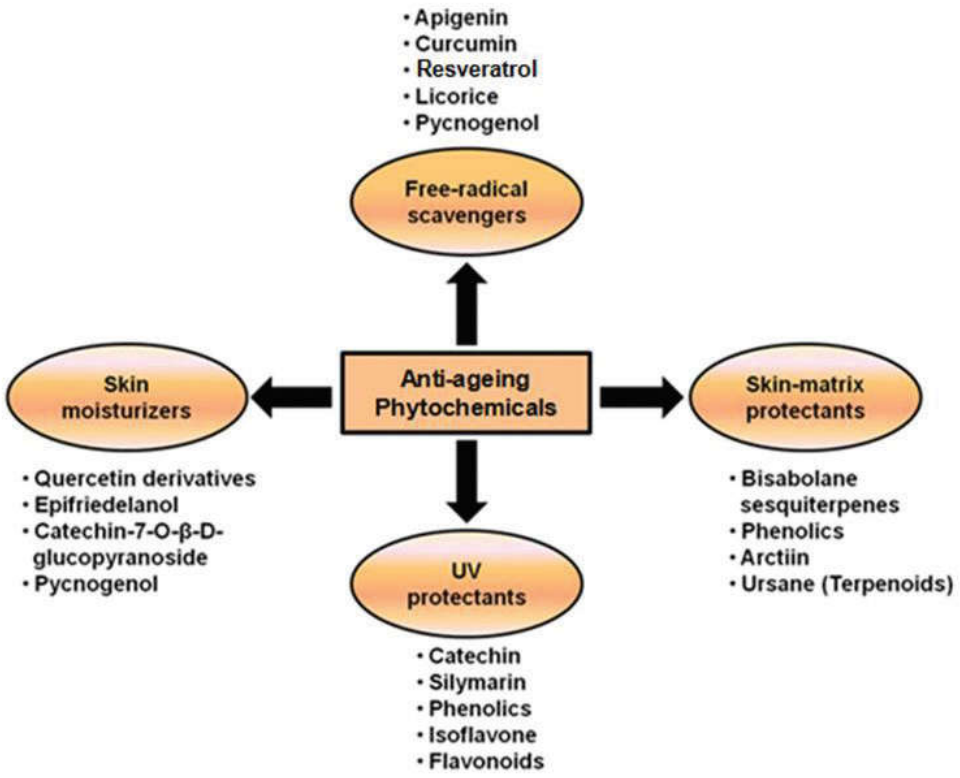


**Fig. 4: Mechanism of action of Herbs in Anti-ageing**

## NATURAL ANTI_AGING HERBS[14, 15, 16]

### ➢ ALOE VERA

**Biological Source:** Aloes are the dried juice of leaves of Aloe barbadensis, belonging to the family Liliaceae.

**Phyto-constituents:** All the varieties of aloe are the major sources of anthraquinone glycosides. The principal active constituent of aloe is aloin, which is a mixture of glycosides, among which barbaloin is the chief constituent. Along with barbaloin, the drug also contains isobarbaloin, β- barbaloin, aloe-emodin and resins.

**Role in Anti-ageing:**

The leaves of aloes are commonly used in anti-aging and anti-wrinkle creams and moisturizers. In the treatment of aging and wrinkles the constituents of aloe Vera such as aloin A and B have shown the property to inhibit the activity of collagenase, the enzyme which causes degradation of collagen fibres.

**Fig.5:** Aloe

**Fig.6:** Amla

➢ **AMLA**

**Biological Source:** This consists of dried as well as fresh fruits of the plant *Emblica officinalis* belonging to the family *Euphorbiaceae*.

**Phyto-constituents:** Amla fruit is a natural source of vitamin C (Ascorbic acid) and also contains fat, phyllembelin and tannins. Amla fruit is also rich in mineral matters like phosphorus, iron and calcium.

**Role in anti-ageing:**

Amla, being a rich source of vitamin C, is considered important to slow ageing process. It improves skin health. Ageing is a cumulative result of damage to various cells and tissues, mainly by oxygen free radicals. Vitamin C is a scavenger of free radicals which breaks them down.

**Fig.7:** Turmeric

➢ **HONEY**

**Biological Source:** Honey is a sugar secretion deposited in honey comb by the bees, *Apis mellifera* and other species of *Apis*, belonging to the family *Apidae*.

.**Phyto-constituents:** Honey is an aqueous solution of glucose (35%), fructose (45%) and sucrose (2%).It also contains maltose, gum, polyphenols, flavonoids, vitamins, proteins etc.

**Role in anti-ageing:**

The antioxidant property of Honey is due to the phenolic compounds (benzoic acid and cinnamic acid) and flavonoids present in it, which helps to prevent wrinkles in our skin.

➢ **TURMERIC**

**Biological Source:** Turmeric consists of dried as well as, fresh rhizomes of the plant *Curcuma longa* belonging to the family *Zingiberaceae.*

**Phyto-constituents:** Turmeric contains a yellow coloured substance known as curcuminoids. The chief component of curcuminoids is known as curcumin (50-60%). It also contains volatile oil, resin, camphor, camphene etc.

**Role in anti-ageing:**

The chief constituent of Turmeric is curcumin which acts as a superoxide scavenger & as a singlet oxygen quencher. Therefore, the anti-ageing property of Turmeric is mainly due to the curcumin.

**Fig.8:** Honey

➢ **GINSENG**

**Biological Source:** Ginseng is the dried root of various species of *Panax,* like *P. ginseng* (Korean ginseng), *P. japonica* (Japanese ginseng), *P. notoginseng* (Chinese ginseng), belonging to the family *Araliaceae.*

**Phyto-constituents:** Ginseng contains a mixture of several saponin glycosides, belonging to triterpinoid group. These are Ginsenosides, Panaxosides and Chikusetsusaponin which are responsible for various activity of ginseng.

**Role in anti-ageing:**

The chief constituent of Ginseng is Ginsenoside which is responsible for the anti ageing activity of the ginseng. It improves the blood circulation and skin tone and also moisturizes the skin.

**Fig.9:** Ginseng

**Fig.10:** Liquorice

- **LIQUORICE**

**Biological Source:** Liquorice consists of dried, unpeeled, roots and stolons of *Glycyrrhiza glabra,* belonging to the family *Leguminosae.*

**Phyto-constituents:** The chief constituent is of liquorice is a triterpenoid saponin known as glycyrrhizin ( glycyrrhizic acid),which is a potassium and calcium salt of glycyrrhizinic acid. It also contains flavonoids, liquiritin and isoliquiritin.

**Role in anti-ageing:**

The anti ageing activity of liquorice is due to the presence of phenylflavonoids (dehydroglyasperin C, dehydroglyasperin D and isoangustone A, which are acts as superoxide scavenger and prevent wrinkles.

- **JATAMANSI**

**Biological Source:** Jatamansi consists of dried rhizomes of *Nardostachys jatamansi* belonging to the family *Valerianaceae*.

.**Phyto-constituents:** It contains volatile oil, resin, sugar, starch and also contains jatamansic acid and ketones, jatamansone and nardostachnone.

**Role in anti-ageing:**

Jatamansi triggers fibroblasts to increase the synthesis of collagen and elastin fibres, due to which skin elasticity increases and wrinkles formation (ageing) decreases.

**Fig.11:** Jatamansi

**Fig.12:** Arjuna

- **ARJUNA**

**Biological Source:** Arjuna consists of dried stem bark of the plant known as *Terminalia arjuna,* belonging to the family *Combretaceae*.

.**Phyto-constituents:** Arjuna contains tannins, triterpenoid saponins, arjunolic acid, arjunic acid, arjungenin. It also contains ellagic acid, arjunine, arjunolone.

**Role in anti-ageing:**

Aging occurs due to decrease in the collagen production. Collagen synthesis and epidermal barrier function is improved by pentacyclic triterpenoids found in *Terminalia arjuna.* It also increases skin moisturization and decreased scaliness. It strengthens the skin barrier and induces sebum production to reduce the signs of dry skin and protect the skin from external challenges. It also contributes to an improved blood circulation for better nutrient supply.

**DISCUSSION:**

Phytochemicals derived from plants have a lot of skin beneficial properties related to UV protection, antioxidant action, matrix protection and skin hydration. Over the past decade, a lot of phytochemicals from the plant extracts have been explored and their biological activities well-studied in vitro. Therefore, there is a continuous requirement for more clinical studies with emphasis on the concentration of the ingredient in herbal products, their formulation, safety, and the anti-ageing effect duration.

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