

# Role of Natural Products in Cosmeceuticals



Arvinder K<sub>1</sub>, Kavya M<sub>2</sub>, Deepa BP<sub>1</sub>, Shilpa M<sub>3</sub> & Bhagya V Rao<sub>2</sub>\*

1Department of Pharmaceutics, 2Department of Pharmacology and 3Department of Pharmaceutical Chemistry  
KLE College of Pharmacy, KLE Academy of Higher Education and Research (KAHER) Bengaluru INDIA 560 010

bhagyavrao.klecop@gmail.com

## INTRODUCTION

The yearning to look young and emerging world market has propelled for the development of many new industries. The first use of cosmetics can be traced back to the Egyptians, circa era i.e., 4000 BC which was used for hygiene and health benefits (1). The primordial Sumerians, Babylonians, and Hebrews also applied cosmetics. In European countries, cosmetics known as Ceruse were used from the second century to the 19th century (2). "Cosmeceuticals" was popularized by Albert M. Kligman in the late 1970s (3). Cosmeceuticals are cosmetic products with biologically active constituents aiming to have medical or drug-like benefits.

The active ingredients in cosmeceuticals are persistently being developed by big and small companies involved in pharmaceuticals, biotechnology, natural products, and cosmetics, while furtherance's in the field and information on the biology of skin has expedited the cosmetic industry's development of unique constituents more speedily. These products are intended to improve physical appearance, health, beauty, and skin diseases. Cosmeceuticals refer to the combination of cosmetics and pharmaceuticals. They can be applied topically, contain ingredients that influence the biological function of the skin. Cosmeceuticals improve appearance by delivering nutrients necessary for healthy skin.

Cosmeceuticals have healing benefits to improve physical characteristics and improve the overall beauty. Commercially, the cosmeceuticals are available as cream, ointments, body lotions, face packs, skin cleansers, fairness formulation, hair shampoo, eyeliner, lipstick, face powder, and beauty soap (4). These products improve the quality of the skin, boost collagen growth, scavenge free radicals, and maintain keratin and skin healthier. Cosmeceuticals may be synthetic, natural, or hybrid depending upon their compositions.

Natural cosmetics encompass naturally available products in unrefined or extract form to offer beautification. Currently, maximum women choose natural products over chemicals for personal care to ameliorate their beauty as these products supply the body with nutrients and

enhance health and provide satisfaction as these are free from dangerous synthetic chemicals and conceived as safe to use with fewer side effects. Natural cosmetics emerged naturally from plants, sea, rock salt, soil, etc. Many medicinal plants and herbs achieve effects like cosmeceuticals and are used to a large extent around the world. Natural herbs like Neem, Henna, Haritaki, Behada, Amalaki, Bringaraj, Rosary Pea, and Mandor, etc. are used in the cosmetic industry for numerous health reasons (5).

### SIGNIFICANCE OF NATURAL COMPOUNDS IN COSMECEUTICALS

Hyaluronic acid, elastin, collagens are the important components of the dermis that plays a crucial role to make skin smooth, elastic, and supple. For skin softness, collagen is playing a tremendous role. Elasticity maintained by the elastin and moisture is going to be controlled by hyaluronic acid which will fill the free spaces of the skin matrix with water and give a young and firmer look to the skin (6). Natural (intrinsic) and the environmental (extrinsic) component will lessen the fabrication of these three elements and skin disposed to aging, damage, and wrinkles (7). In our daily life, whatever natural compounds we are eating, drinking, or applying, are directly going to affect the appearance of skin. Natural products which are going to be formulated from natural compounds proved to play a crucial role in reducing wrinkles, aging, and maintaining the moisture of the body (Figure 1). Many harmful chemicals and toxins are found in daily use cosmetics that are showing damaging effects to the skin and there is an increased awareness among consumers for use of natural products. Natural products are fundamentally biological and nutritional with plenty of healthy effects (8).

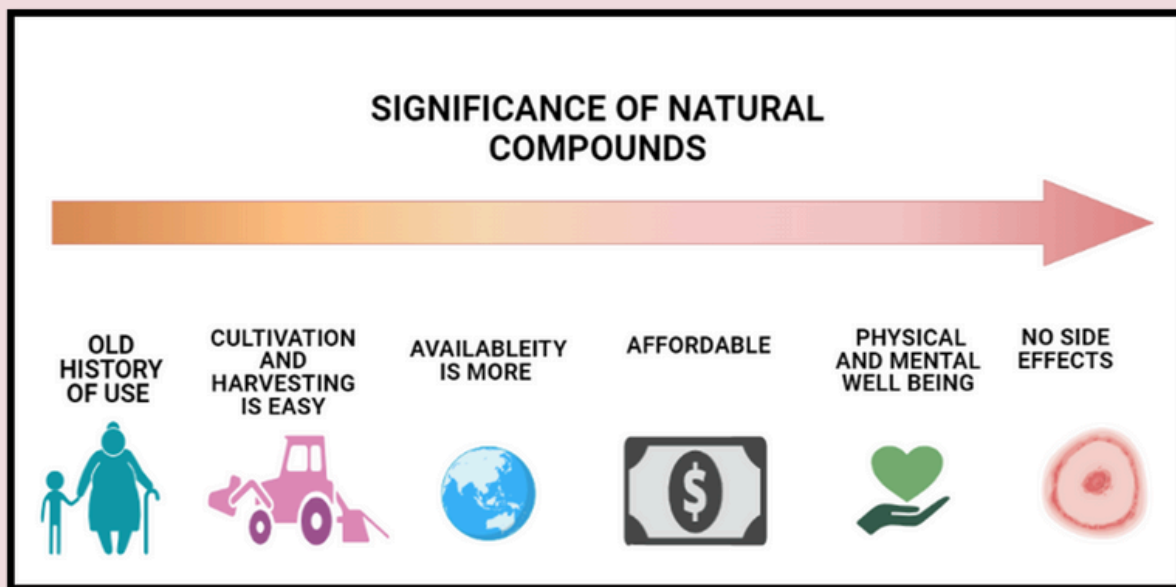


Figure 1: Major Significance of Natural Compounds

## Cosmeceuticals as Anti-aging agents

A mixture of cellular metabolism, gene mutations, hormone environment as well as chemicals, contagion, pollutants, UV, and radiation with ions are the main factors behind skin aging (9). Healthy, glowing, flawless, and beautiful skin are significant for wellbeing and the perception of health in humans. Body parts which are directly exposed to the sun get affected by endogenous or intrinsic aging factors that takes place in internal organs (10). As the cult of skincare grows and people become conscious about their look, pampering of skin becomes a primary desire. As men and women are working, sometimes it will be very difficult to give time for skin care from their busy schedule. Exposure to stress in everyday life directly or indirectly goes toward aging (11). Skin is the important and widest body part exposed and hence taking care of skin is of utmost importance. Natural products which are easily available at home (Table 1) play a key role in delaying aging. Natural products have been used for thousands of years, for their convenience as well as the diversity and abundance in compounds with biological activity. With an estimated \$42.8 billion worth sale of natural products in cosmeceuticals, they have become the fastest growing and trending beauty category in the world (12).

Table 1: Easily available natural anti-aging products with examples, chemical constituents and marketed product

Anti-aging products	Examples	Chemical constituents which help to reduce wrinkles	Marketed product available in India	Ref.
<b>Aloe vera</b>	Aloe as gel	Vitamins A (beta-carotene), C and E, antioxidants	Himalaya moisturizing face wash Patanjali saundrya aloe vera gel	(13)
<b>Banana</b>	Banana as mask	Natural oils and vitamins, flavonoids, phenolic acids, tannins	Sara banana mask A'pieu banana face mask The body shop banana mask	(14)
<b>Super foods</b>	Berries, dark green leafy vegetable, sea foods, nuts and seeds, beans and legumes	Catechin polyphenols, vitamins A, B and C, selenium, iodine, potassium, iron, calcium, zinc and magnesium	Terra origin Bgreen superfoods and fruits Kapiva Fast & Up	(15, 16)
<b>Egg</b>	Albumin	Vitamin E	Bioven ingredients. Egg white pore mask Madren health care egg albumin protein	(17)
<b>Essential oils</b>	Black caraway, Dill, Celery, Fennel, Anise Cumin, Coriander	Citronellol, curzerene, limonene, Linalool, (E)-ocimene, pinene, Sabinene, terpinolene	Atulya pure essential oil Patanjali Tejus Tailum	(18)
<b>Citrus fruits</b>	Orange, Lemon	Vitamin C	The body shop vitamin C daily glow cleansing polish Orange 10-fold oil Vitamin C citrus fruit face cream	(19)
<b>Probiotics and Yoghurt</b>	Probiotic, Curd	Lactic acid	Himalyan probiotic supplement Setu probiotics Nandini curd Milkymist curd	(20)

## **Alopecia**

Alopecia is one of the major issues worldwide which is affecting all age groups nowadays. There are various disorders associated with hair which include balding, shedding, dandruff, and fading of hair. Various reasons causing hair loss include hereditary factors, hormonal changes, poor nutrition, aging, physical and emotional stress, autoimmune diseases, chemotherapy, excessive hairdressing, vitamin deficiency, etc. Both synthetic and natural products are available for promoting hair growth. Natural products have fewer side effects compared to synthetic products; hence it is gaining importance nowadays. As of now, only two FDA-approved drugs are available in the market for treating hair loss, i.e., Minoxidil and finasteride. Owing to their adverse effects such as erythema, scaling, pruritus, gynecomastia, skin rash, and itching, the use of natural products are booming in preventing the hair disorders (21). There are many herbal products which promote hair growth and are easily available.

### **1. Indian gooseberry/ Amla**

Normal healthy growth and its maintenance require iron. Oxygenation of RBCs occurs in the presence of iron. Lack of iron in the body leads to oxygen deficiency and in turn hair loss which can be overcome by the use of amla that promotes iron metabolism. It also helps in the stimulation and proliferation of dermal papilla cells which also lead to hair growth promotion (21).

### **2. Green tea**

Camellia sinensis leaves have potential benefits like anti-inflammatory, anticancer, and antioxidant properties. Consuming green tea reduces inflammation and induction of stress which has a positive influence on hair growth. Epigallocatechin-3-gallate, a constituent of green tea leaves has anti-apoptotic and proliferative effects on dermal papilla cells which enhance the growth of hair (21).

### **3. Shikakai**

Dried and powdered shikakai when applied in the form of paste on the scalp can help in hair growth promotion by strengthening hair follicles, preventing dandruff, and also acts as a natural conditioner. An added advantage is that shikakai will not damage hair owing to its low pH level (21).

### **4. Henna (*Lawsonia inermis*)**

Henna belongs to the family Lythraceae. Lawsone is one of the major components of Henna which acts as a colouring molecule. This stains the colour on the hair shaft due to its natural affinity with the proteins of hair (22). Other constituents of Henna like flavonoids and gallic acid also contribute to the colouring process. Apart from its colouring property, Henna also prevents hair fall and grey hair formation. Henna's antifungal activity also helps in alleviating jaundice, smallpox, and other skin diseases (23).

### **5. Almond oil (*Prunus dulis*)**

Almond belongs to the family Rosaceae. Almond oil can be used as a hair care product. The presence of 78 % fat and small amounts of super unsaturated Omega 3 essential fatty acids helps in the nourishment of hair, which also strengthens and softens the hair (24).

## **6. Bhringaraja (Eclipta alba)**

Bhringaraja belongs to the family Asteraceae. It stimulates hair growth and hence it is used as a component of polyherbal formulations, shampoos, and hair oil (25). The extracted juice of Bhringaraja is known to blacken the hair when consumed and even applied to the scalp. The primary constituents of *Eclipta alba* include heptacosanal, wedalolactone, desmethyl-wedalolactone-7-glucoside, etc. Promotion of follicular enlargement and anagen phase prolongation is observed with Bhringaraj petroleum ether extract. Promotion of hair growth is reported with the methanolic extract of *E. alba*.

## **7. Nagarmotha (Cyperus rotundus)**

Nagarmotha belongs to the family Cyperaceae. The hair oil and hair creams containing Nagarmotha extract resulted in follicular size enlargement and anagen phase prolongation which has potential hair growth promoting activity. The chemical constituents of *Cyperus rotundus* are  $\alpha$ -cyperone, cyperene,  $\beta$ -selinene, pinene, cyperol, cyoerone, etc. (25).

## **8. Maidenhair (Ginko biloba)**

Maidenhair is known to be beneficial for human health. It increases oxygen supply to the brain and skin by increasing blood circulation. A combination of Ginko extract with hormones and Ginko extract with stearyl glycyrrhizinate depicts synergism in hair growth. Leaf extract of maidenhair has potential effects in follicular proliferation and cell apoptosis which enhance hair growth when used as a hair tonic. The chemical constituents of maidenhair include ginkgolides A, B, C, J, M, bioflavin, sitosterol, lactones, and anthocyanins (26).

## **9. China rose (Hibiscus rosa-sinensis)**

China rose belongs to the family Malvaceae. Usage of extract of china rose leaves on mice showed improved hair length and anagen /telogen ratio of hair follicles. Increased hair growth and alleviation of ulcer is observed with leaves and flowers of China rose (26). The polyherbal formulation of *Hibiscus rosa-sinensis*, *Eclipta alba* and *Nardostachys jatamansi* affected the anagen phase and follicular size, and promoted hair growth.

## **7. Onion (Allium cepa)**

Many sulphur and phenolic chemicals, albumin, and minerals such as zinc, calcium, and magnesium are found in onions. After 8 weeks of treatment, crude onion juice increased hair growth in areas of patchy hair loss (27). The presence of zinc in onions also helps to prevent dandruff by secreting much-needed oil (21).

## **Skin Pigmentation**

Melanocytes in the epidermal basal layer create melanin, which gives skin its colour (28). Different amounts of melanin, as well as skin ageing result in abnormal skin colouring. Melanin is a pigment that not only gives skin colour but also protects it from the sun's rays. Melanin can be found in two different types: Eumelanin is a brown or black pigment that absorbs UV rays effectively. Pheomelanin is a light brown/red pigment that is chemically reactive and absorbs UV energy inadequately (29). As a result, the concentration and ratio of eumelanin and pheomelanin influence the appearance of each skin.

Abnormal skin pigmentation appears as: Hypomelanosis and Hypermelanosis (30). Abnormality of skin is closely related with hair abnormalities (31). In addition, deficiency of anti-oxidant system or imbalance of mitochondrial redox reaction lead to oxidative stress and thus, hypopigmentation (32). Because clinical data demonstrated that anti-oxidant therapy could reduce hypermelanogenesis generated by UV radiation, there is a tight association between hyperpigmentation induced by UV radiation and oxidative stress (33).

Natural compounds are rich in coumarin derivatives, polysaccharides, terpenoids, and flavonoids, all of which are known to have anti-oxidant and anti-inflammatory characteristics. (34). Previously it was shown that active elements from numerous herbs, such as Eucalyptus, Papaya, Ginger, Tulsi, Amla, Neem, Aloe, and others, have been found to be useful and safe in the treatment of skin diseases. In addition, when compared to other treatments, these herbs are less expensive and have fewer side effects (35).

Table 2: Natural Compounds for Skin Pigmentation

Sl. No.	Biological Name	Vernacular Name	Family	Part Used	References
1.	<i>Aloe vera</i>	Indian Alces, Kumari, Ghirita, Gawarpaltra	Liliaceae	Gel	(36)
2.	<i>Berberis aristata</i>	Tree turmeric, Daru haldi	Berberidaceae	Berries	(37)
3.	<i>Calendula officinalis</i>	Marigold, Pot marigold	Asteraceae	Flower	(38)
4.	<i>Camellia japonica</i>	Japanese camellia, Common camellia	Theaceae	Oil	(39)
5.	<i>Citrus sinensis</i>	Orange, Sweet Orange	Rutaceae	Fruit	(40)
6.	<i>Curcuma longa</i>	Turmeric, Haldi, Arishina	Zingiberaceae	Rhizome	(41)
7.	<i>Emblica officinalis</i>	Indian gooseberry, amla	Euphorbiaceae	Fruit	(42)
8.	<i>Glycine max</i>	Soyabean, Soja	Fabaceae	Seeds	(43)
9.	<i>Kaempferia pandurata</i>	Chinese ginger, Fingerroot	Zingiberaceae	Rhizomes	(44)
10	<i>Labisia pumila</i>	Siti Fatimah, Pokok Pinggan	Myrsinaceae	Root	(45)
11	<i>Magnolia ovovata</i>	Japanese White bark	Magnoliaceae	Root	(46)
12	<i>Panax ginseng</i>	Chinese ginseng	Araliaceae	Root	(47)
13	<i>Piper betel</i>	Betel, Betel pepper	Piperaceae	Leaves	(48)
14	<i>Prunus dulcis</i>	Almond, Sweet almond	Rosaceae	Nut	(49)
15	<i>Tagetes erecta</i>	African marigold	Asteraceae	Flowers	(50)
16	<i>Terminalia chebula</i>	Gallnut, black myrobalan	Combretaceae	Bean	(51)
17	<i>Theobroma cacao</i>	Cacao tree	Sterculiaceae	Bean	(52)
18	<i>Vaccinium uliginosum</i>	Bog blueberry	Ericaceae	Berries	(53)
19	<i>Vitis vinifera</i>	Common grape, European wine grape	Vitaceae	Shoot	(54)
20	<i>Zingiber officinale</i>	Ginger	Zingiberaceae	Rhizomes	(55)

## Skin Whitening agents

Every year, the amount spent on skin-whitening products rises. Because the vast majority of people believe that having a lighter skin tone improves their appearance and attractiveness (56). Many variables influence skin colour, including genetics (intrinsic) and environmental contaminants (extrinsic), as well as exposure to sunlight (57). Melanin, another driver of skin tone, contributes colour to skin through its synthesis and distribution across the skin (58). The epidermis is the outermost layer of the skin, and it is made up of melanocytes that generate melanin. The amount of melanin helps determine the colour of human skin. Melanosomes are organelles found in melanocytes that are responsible for the primary synthesis of melanin, through a process known as melanogenesis. Melanogenesis is a series of processes that result in the production of Eumelanin and Pheomelanin (59).

Terpenoids, polysaccharides, flavonoids, and coumarin derivatives are natural chemicals that have been shown to have anti-oxidant, anti-inflammatory, and anti-melanogenesis properties. In comparison to synthetic substances, natural compounds are cheaper and safer. In addition, these natural compounds inhibit the uptake and distribution of melanosomes (60). Natural compounds are extensively utilized to prevent hyperpigmentary disorder. Some natural substances that can be used as skin whitening agents in this area have been listed below (34).

Table 3: Natural active skin whitening agents that are currently known based on their compound classification along with their sources

Structure type	Source	Reference
<b>Phenolic Compounds:</b>		
Protocatechuic acid	Pear fruits	(61)
<i>Heracleum moellendorffii</i> Hance extract	<i>Heracleum moellendorffii</i>	(62)
Sesamol	Sesame	(63)
Phenolic extracts	Rape bee pollen	(64)
Gallic acid	Gallnut, Lacuer tree, tea	(65)
Ethyl acetate fraction of bamboo stems	<i>Phyllostachys nigra f. henosis</i>	(34)
<b>Flavonoids and polyphenolic compounds:</b>		
Pomegranate concentrate powder	Pomegranates	(66)
Sorghum ethanolic extract	Sorghum	(67)
Methyl linoleate Ginsenoside	<i>Sageretia thea</i>	(68)
	<i>Panax ginseng</i>	(69)
<b>Polysaccharides:</b>		
<i>Ganoderma lucidum</i> polysaccharide	<i>Ganoderma lucidum</i>	(70)
<i>S.japonicus</i> extract	<i>Stichopus japonicus</i>	(71)

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