Natural Cosmeceuticals Contribution to Skin Care Preparations: A Review

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ABSTRACT

The present chapter is based on the use of natural cosmeceuticals in skin care preparations. Nowadays, natural cosmeceuticals are introduced in the market as many people are looking for natural alternatives to synthetic chemicals found in traditional skincare. Cosmeceutical means a combination of cosmetics and pharmaceuticals which are applied topically, as cosmetics yet contain therapeutic or bioactive ingredients that affect the skin's biological function. The use of bioactive extracts or phytochemicals from a variety of botanicals can be accomplished in skin care preparations that act as an antioxidant, anti-inflammatory, antibacterial, anti-acne, sun protective, and skin whitening agent. In the present review, extensive literature research was undertaken to summarize suitable natural cosmeceuticals that can be suggested for the contribution to skin care preparations. Various ayurvedic medicinal plants and herbs are beneficial for contributing to skin care preparations and in addition to skin healing benefits, future research should attempt to determine this directly.

Keywords: Natural cosmeceuticals; ayurvedic medicinal plants; antioxidant; anti-inflammatory; antibacterial; sun-protective agent; skin whitening; skin care preparations

I. INTRODUCTION

Cosmeceuticals are the next generation of skincare. They are advances made in the world of dermatological products and a new backbone for skin care. The term "cosmetic" was derived from the Greek word "Kosm tikos" defined as "skilled in adornment or arrangement" having the power and skill in arranging and decorating. Some cosmetics are natural while others are made, but they all contain active ingredients that have medicinal, antioxidant, antibacterial, anti-inflammatory, or healing properties [1].

Cosmeceutical is usually a combination of cosmetics that are designed to improve the health and beauty of the skin. Cosmeceutical products are preparations containing secondary metabolites from a variety of plant sources that influence the functions of the skin and supply necessary nutrients for healthy skin [2]. Skin care preparations are medicinal preparations intended to be placed in various external parts of the human body that manifest various beneficial topical applications and provide protection against various skin conditions [3]. Plant extracts and the use of plant parts such as roots, stems, barks, leaves, flowers, fruits, seeds, and whole herbs have been known in cosmetic and pharmaceutical applications since ancient times. These biologically active plant extracts have medicinal benefits to improve various skin conditions and were used for purposes such as sun-protective agent, radical-scavenging, antioxidant, anti-inflammatory, antibacterial, etc. [4].

Medicinal plants have great potential to contribute to new cosmeceutical preparations and are also used in traditional medicine to treat various diseases [5]. In the present review, some medicinal plants have attempted to investigate the antioxidant, anti-inflammatory, anti-bacterial, sun-protecting, and skin-lightening activity.

II. NEED FOR NATURAL COSMECEUTICAL FOR SKIN CARE

a. Antioxidant

Antioxidants are used in cosmeceutical preparation including various substances and extract which is isolated from a wide range of plants, fruits, and grains which is capable of reducing oxidative stress on the skin as well as protecting the formulation from oxidative reaction. Antioxidants are classified into two parts which is primary or natural antioxidant and secondary or synthetic antioxidants. A natural antioxidant can be found isolated as a combination of compounds or plant extract which is widely used in cosmetic products. Antioxidants prevent the enzymatic activity required for auto-oxidation [6]. Antioxidant molecules that prevent oxidation or slow the oxidation of another molecule. Basically, oxidation is a chemical reaction that donates electrons from a substance to an oxidizing agent. Antioxidants are capable of deactivating free radicals before they attack cells [7]. It is reported that tocopherols and tocotrienols, ascorbic acid, flavonoids, carotenoids, and phenolic acids are the most important groups that showed natural antioxidant properties. The study also revealed that Vitamins E and C are the most important vitamins used as natural antioxidants [8].

b. Anti-inflammatory

The word inflammation is derived from the Latin "flamma" meaning flame [9]. The inflammation is exerted by some external factors including irritants, injuries, wounds, or pathogen infections. The symptoms of inflammation are local redness, swelling, pain, heat, and loss of function. The mechanism includes anti-inflammatory drugs that disturb the physiological activity of inflammation and minimize tissue damage. Depending upon the time of inflammatory response in the affected tissue, it can be classified as acute (initial) or chronic (prolonged) inflammation. The study revealed that secondary phytochemicals such as phenols, triterpenes, flavonoids, and cinnamic acid are responsible for the anti-inflammatory properties and are used as active ingredients in cosmeceutical formulation which is economically safe [10].

c. Anti-bacterial

Antibacterial agent in cosmeceutical application plays an important role in the durability and stability of various formulation because cosmeceutical products contain organic and inorganic compounds that are responsible for the development of pathogenic microorganism which is harmful to human skin. Therefore, the antimicrobial agent is increasing the durability and safety of consumers. Antimicrobial agents inhibit the growth of microorganisms which is effective for primary and secondary microbial infections in cosmeceutical preparation. Due to their antimicrobial activity, it has also been used as preservatives. It is reported that many plant extract-containing metabolites have the potential to act against a wide range of Gram-positive and Gram-negative bacteria [11]. The study also revealed that plants containing essential oil and volatile substances such as monoterpenes, sesquiterpenes, and polypropanoids are active against gram-negative and gram-positive bacteria, fungi, and viruses [12].

d. **Sun Protective agent**

Ultraviolet radiation is responsible for many skin problems. For example, Sun burns due to prolonged exposure in the sunlight. Ultraviolet rays are categorised into three types namely, UV-A, UV-B, UV C in which, UV- A is responsible for skin cancer, risk of skin aging, dryness and dermatological photosensitivity [13]. UV- B radiation is also known as burning rays which is capable of burn skin 1000 times more as compare to UV-A radiation and these rays are passed into epidermis layer of skin and produce adverse effect like DNA damage, sunburn, erythema and chemical hypersensitivity [14]. It is reported that, natural compound extracted from plants includes polyphenol compounds which gives anti -inflammatory and antioxidant property and therefore, it has ability to act as a sun screening agent due to their UV-assimilation and antioxidant property. The study also revealed that, natural ingredient is capable to give effective sun protective property which is economically safe and act as an effective UV- filters. Therefore, many plant derived extract contain UV blocking agent used in cosmeceutical preparation [15].

e. **Skin Lightening agent**

Melanogenesis produces melanin and therefore human skin suffers from pigmentation. Melanin is mainly formed by melanocytes which are in the epidermis i.e., the Outer layer of skin [16]. Under physiological conditions, pigmentation protects the skin from harmful UV rays, but overproducing melanin causes many skin problems such as melasma, pigmentation of ephelides, and post-inflammatory Hyper-pigmentation. A large number of plant species is responsible for skin-lightening ability due to the presence of bioactive compounds which is isolated from various parts of the plant including flowers, fruits, seeds, leaves, bark, stems, rhizomes, roots, and even whole plant. The study showed that natural skin-lightening agents are the best alternative to chemical substances because of their fewer side effects and safety for the skin. Examples of natural bioactive compounds such as flavonoids, terpenoids, polysaccharides, and coumarin derivatives are responsible for the anti-melanogenesis function [17]. It is reported that phenolics are the most widely used skin whitening agent, retinoids or vitamin A stimulate cell turnover and promote rapid loss of melanin through epidermolysis. Similarly, tocotrienols and derivatives of vitamin E are composed of four homologs; α-, β- γ, and δ-tocotrienols, in which δ-tocotrienols were responsible for inhibiting melanin production. Therefore, cosmeceutical formulations containing skin-lightening agents are a powerful approach to this problem [18].

III. NATURAL PLANT INGREDIENTS AS COSMECEUTICALS

a. *Hemidesmus Indicus*

The common name of *Hemidesmus Indicus* is 'Indian sarsaparilla', also popularly known as *Anantmool*. It is a medicinal plant traditionally used as a natural remedy, therefore mostly used in Ayurveda, Unani, and Siddha systems [19]. The most useful part of the *hemidesmus indicus* is root and it has a sweet taste and pleasant smell due to the presence of an essential oil containing p-methoxy salicylic aldehyde as a major constituent [20]. Earlier reports represent the presence of a mixture of therapeutic phytocompounds such as terpenoids, tannins, phenols, flavonoids, and saponins which are responsible for their anti-oxidant and anti-inflammatory properties [21]. The study revealed, flavonoids and nutrients like copper, iron, magnesium, Vit. A, Vit D, and zinc are powerful ingredients as anti-aging in the skin around the eyes [22]. It has significant potential to be used in many skin, hair, and oral care benefits due to the presence of phytoconstituent and its use as an herbal ingredient in various cosmeceutical formulations. In many of the cosmeceutical formulations, roots are used as an ingredient for antiacne, anti-microbial, antioxidant, and anti-inflammatory agents [23].

b. *Arntinum lappa*. L. (burdock)

Arntinum lappa. L. is a medicinal plant commonly called "burdock "or "bardana" and belongs to northern Asia, Europe, and North America [24]. The important bioactive compounds in the roots of burdock contain volatile compounds, tannin, β-eudesmol, caffeic acid, chlorogenic acid, inulin, trachelogenin, sitosterol-β-D-gluco-pyranoside, lappaol, terpenes, arctiin. And fresh burdock root contains lipids and carbohydrates [25]. The dried roots of burdock are 1-year-old used for the treatment of some inflammatory diseases like sore throat and some infections such as rashes and various skin problems and also give relief from inflammatory diseases [26]. It is reported that roots containing dietary fiber inulin include some antioxidant polyphenols that give anti-inflammatory properties [27]. It has the highest antioxidant activity due to the high polyphenol content. Therefore, it has a high significant potential to be used as an antimicrobial, antioxidant, anti-allergic, antiacne, and anti-inflammatory activity [28].

c. *Panax Ginseng* C.A. Meyer (Ginseng)

Panax ginseng Mayer is commonly known as ginseng. It is used as a traditional medicine for the treatment of diseases [29]. Ginseng is the dry root and rhizome of P. ginseng which is mostly used as herbal medicine to cure various skin problems [30]. The bioactive ingredients of ginseng contain steroid, saponins, and protopanaxadiols collectively known as ginsenosides which gives anti-aging and whitening properties. Recently gintonin was also identified as an active ingredient in ginseng [31,32]. It performs significant functions as an anti-inflammatory, antioxidant, antibacterial, antiviral, and antifungal activity in cosmeceutical preparation [33].

d. *Rhodiola Rosea*

Rhodiola rosea is also known as "roseroot", "golden root" or "arctic root". It is a traditional medicinal plant used in herbal medicine [34]. Rhodiola is rich with bioactive compounds including Phenyl prostanoids, gallic acid, salidroside, flavonoids, terpenoids, Coumarin, organic acid compounds, etc., which shows antioxidant, anti-inflammatory, anti-aging, and anti-fatigue effects It is reported as thyrozine and salidroside is responsible for aging prevention and smooth elastic skin [35,36]. Rhodiola rosea rhizomes are used to treat seborrheic, dermatitis, acneiform rash, wide-pore skin, and antiperspirant. Studies revealed the potential use of *Rhodiola rosea* in skin care cosmeceuticals as an anti-inflammatory, antioxidant, skin whitening, anti-aging, and anti-photo aging [37].

e. *Rubia cordifolia* L (Manjishtha)

Rubia cordifolia Linn. The common name of Manjishtha is Indian Maddar [38]. It is valuable Roots of Rubia cordifolia are perennial, long, cylindrical, and reddish or rusty brown which contain tannins. The overall part of the root containing red color denotes the presence of anthraquinones. According to Indian Ayurveda, manjishtha has various properties in *Ayurvedic* formulations such as mahamanjishthadi, kvetha, manjisthadi taila, majishtha arka, etc. [39]. It is reported that secondary metabolites of manjishtha include saponins, tannins, phenols, flavonoids, alkaloids, steroids, and glycosides [40]. The root extract of manjishtha containing chemical constituent i.e. rubidium gives antioxidant properties [41]. It also has high significant potential to be used as antioxidant, anti-inflammatory, and anti-acne activities. In cosmeceutical preparation, it is used for glowing skin, removing pimples, freckles, and discoloration, and for many skin-related diseases [42].

f. *Cinnamomum*

Cinnamomum is a widely used spice for its medicinal and cooking uses. It is a small tropical tree and is commonly known as cinnamon. The bark of various cinnamon species is one of the most important and popular spices used worldwide [43]. There are over 300 species of cinnamon, but the most diffused nutraceuticals are *Cinnamomum verum* J. Presl, *Cinnamomum aromaticum,* or *Cinnamomum cassia* (L.) J. Presl, *Cinnamomum burmanni* Nees ex Blume and *Cinnamomum loureiroi* Nees. The most interesting compounds of bioactive Cinnamomum accessions are vanillic acid, caffeic acid, gallic acid, ρ-coumaric acid, ferulic acid, proanthocyanidins A and B, kaemferol, cinnamic acid, and cinnamaldehyde, which exhibit several human beneficial effects [44]. It is reported that the compounds containing eugenol, cinnamaldehyde, and coumarin reduce acne blemishes and therefore it has gained popularity for use in skin care products. It contains amazing properties like anti-inflammatory, anti-oxidant, anti-aging, skin lightening, and antibacterial properties and therefore can be used in skin remedies [45].

g. *Acacia Catechu* (L.f)

Acacia Catechu (L.f.) Willd., commonly known as 'Khadira' in Sanskrit is a deciduous tree widely used in Ayurveda for many years for the treatment and prevention of various diseases. The bark of this plant is a medicinally potent product, having a wide range of therapeutic potential applications [46]. In Ayurveda, it is used against leprosy and skin diseases [47]. It is reported that it contains various saponins, tannins, amino acids, carbohydrates, proteins, steroids, alkaloids, flavonoids, and phenolic compounds [48,49]. It performs significant functions as an anti-inflammatory, antimicrobial, and antioxidant agent, which can be considered as having good potential for skin care preparations [50,51,52].

h. *Albizia lebbeck*

Alibizia lebbeck (L.) Benth., commonly known as 'Sirisa' in Sanskrit is a deciduous tree having tremendous medicinal utilities. According to the Ayurvedic Pharmacopoeia of India (2016), the stem bark possesses therapeutic uses such as *Pama* (eczema), *Kushta* (leprosy), *Sotha* (inflammation), and many more. It retains various properties and actions; for example, *Rasa* is *Madhura* (sweet), *Katu* (pungent), *Tikta* (bitter), and *Kasaya* (astringent), *Guna* is *Laghu* (Lightness), *Tvagdosa* (skin disease), and *Varnya* (skin lightening) [53]. It is reported that the secondary metabolites of *A. lebbeck* include saponins, macrocyclic alkaloids, anthraquinone, steroids, triterpenoids, phenolic glycosides, and flavonoids [54,55]. The study also revealed that Lupene-type triterpenoids from the stem bark of *Albizia lebbeck* are used to treat inflammation and act as an anti-inflammatory [56]. It has a significant potential to be used in cosmeceuticals due to its antioxidant and antibacterial properties [57,58].

i. *Aloe barbadensis* (Aloe vera)

Aloe barbadensis miller. is a medicinal plant with lots of skincare properties that has been used since ancient times. Locally, it is called 'ghrit kumari 'or 'gwar patha' [59]. *Aloe* leaf has three layers, the inner layer is the form of a transparent gel containing 99% water and 1% solid matter, the middle layer forms bitter yellow juice and the outermost layer is thick [60]. It is reported that *Aleo* leaf gel is used in different cosmeceutical formulation due to the presence of nutrients and bioactive compounds such as vitamins, enzymes, minerals, sugars, lignin, anthraquinones, saponins, salicylic acids, and amino acids which gives medicinal properties. The study also revealed that phytochemical compounds have multiple beneficial properties including anti-inflammatory, antibacterial, antioxidant, antiaging, and sunburn relief [61].

j. *Camellia Sinensis* (Green Tea)

Camellia Sinensis. is the second most popular drink in the world after water. Green tea and black tea belong to the same species but they differ in their processing, associated oxidation, and fermentation level. Green tea is an oxidized and non-fermented tea. The main chemical compounds in *camellia sinensis* are polyphenols (~90%), amino acids (~7%), theanine, proanthocyanidins, and caffeine (~3%). Among the different polyphenols, catechins, and flavonols such as myricetin, caempherol, quercetin, chlorogenic acid, coumarylquinic acid, and theogallin are the major constituents in it [62]. It retains various properties in cosmeceutical formulation due to their multidirectional effects such as antioxidant, anti-inflammatory antiaging properties. It is reported that tea extract is used for many cosmeceutical formulations such as creams, Moisturizing lotions, tonics, and cosmetic

facial masks, the study also revealed that *Camellia sinensis* is not only recommended for young and problematic skin but also for reducing excessive sebum production, irritant and for sensitive skin [63,64].

k. *Eucalyptus*

Eucalyptus spp. is an evergreen flowering plant having 900 species and subspecies in which *Eucalyptus globulus* and *E. citriodora* both belong to subtropical regions of India. The essential oils obtained from leaves are rich with phytochemicals such as eucalyptol,1-8 cineol, limonene, citronellal, citral, eudesmol, α-β pinene, etc. [65]. It is reported that the methanolic extract of eucalyptus leaves contains saponins, quinone, carbohydrates, tannin, phenol, and fat. It retained various properties such as antioxidant, anti-inflammatory, and antibacterial properties. Therefore, the extract of eucalyptus leaves is used in various cosmeceutical products. The study also revealed that leaf oil of *eucalyptus spp.* is also used for wide application in creams, deodorizers, detergents, lotions, perfumes soaps [66].

l. *Oenothera biennis*

Oenothera biennis L., commonly known as Evening Primrose as flowers open in the evening [67]. *Oenothera biennis* widely used in diverse fields, such as pharmacology, cosmetics, perfumery, nutraceuticals, beverages, and dyeing industries. The bioactive ingredients of evening primrose contain gallic acid, caffeic acid, flavonoids, epicatechin, coumaric acid, ferulic acid, rutin, rosmarinic acid fatty acids, phenolic acids, and linoleic acid [68]. Linoleic acid prevents the skin from peeling and the loss of water through the epidermis also at the same time improving skin softness and elasticity [69]. *Oenothera biennis* L. performs significant functions as antioxidant, anti-inflammatory, anti-bacterial, anticancer, antiobesity, antiproliferative, and antimicrobial activities in cosmeceutical preparation [68,69].

m. *Calendula officinalis*

Calendula officinalis L., also known as marigold, is a therapeutic herbaceous plant [70]. *Calendula officinalis* has medicinal capabilities stated in the Ayurvedic and Unani systems of medicine [71]. Traditionally as a skin remedy for dermatological problems, such as inflamed skin, redness, minor burns, or ulcers, as well as for acne or fungal eruptions, wound healing, inflammation reduction, soothing, and skin softening, skin conditioning, emollient, skin protection, fragrance, perfuming, and flavoring agent. It contains several bioactive compounds, including volatile oils, saponins, flavonoids, calendulin, sterols, fatty acids, calendic, oleanic acids, triterpenoids, tocopherols, carotenoids, sesquiterpenoids and polyphenols [72]. Its flower oil is the main preparation used in cosmetic products for sensitive skin and soothing products including skin, eye, hair, and bath products. *Calendula officinalis* exerted many therapeutic effects including antibacterial, antifungal, anthelmintic antiviral cytotoxic, antioxidant, anti-inflammatory, analgesic, hepatoprotective, cardioprotective, gastroprotective, wound healing, and many other effects. It is potentially an important medicinal plant used in cosmeceutical preparation [73].

n. *Malva Sylvestris* (Mallow)

Malva sylvestris L. (Malvaceae) is a medicinal plant commonly known as mallow. *M. sylvestris* is used for curing various infections or disease ailments for humankind. *M. sylvestris* flowers and leaves are used as a valuable remedy for inflammatory diseases and their healing abilities from the mucilage and flavonoids found in the leaves and flowers [74]. The bioactive ingredients of *Malva sylvestris* contain mucilage, tannins, malvyn, malvidin, folic acid, flavonoids, polysaccharides, coumarins, gossypetin, hypolaetin, niacin, vitamin A, vitamin C, vitamin E, and fatty acids [75]. These phytochemicals are responsible for many pharmacological activities such as antioxidant, anti-inflammatory, anti-cancer, wound healing, hepatoprotective, antinociceptive, and antimicrobial properties therefore it is widely used in cosmeceutical preparation [76].

o. *Achillea millefolium* L

Yarrow *(Achillea millefolium L.)* is one of the most widely used medicinal plants. [77]. It is used as a natural remedy for the treatment of wounds, digestive problems, respiratory infections, bleeding, headaches, inflammation pains, spasmodic diseases, flatulence, dyspepsia, and skin conditions [78]. The secondary metabolites of *Achillea millefolium L.* contain salicylic acid, asparagin, sterols, flavonoids, bitters, tannins, coumarins, phenolic acids, terpenes, guaianolides, phytosterols, fatty acids, and organic acids [79]. *Achillea millefolium* L. is used as an astringent, antimicrobial, anti-inflammatory, antioxidant, antibacterial, antifungal, hemostyptic, antiparasitic, antispasmodic, anticancer, and antiseptic in cosmeceutical preparation. *Achillea*

millefolium is used as a cleansing agent in the cosmetic industry and is also used in skin and hair care preparations. It promotes healing and cleansing properties [77,78,80].

p. *Hylosereus undatus* (Dragan fruit)

The dragon fruit (*Hylosereus* genus) or pitaya is a rustic fruit having medicinal potential for the prevention of diseases associated with inflammatory and oxidative processes. There are three varieties that are distinguished by colour of the skin and flesh that are mainly cultivated: *Hylosereus undatus* (possessing white flesh and red skin), *H. polyrhizus* (with red skin and red flesh), and *H. megalanthus* (yellow skin and white flesh) [81]. It is reported that betalains, flavonoids, polyphenols, terpenoids, steroids, saponins, alkaloids, tannins, and carotenoids, can be extracted from all the parts of pitaya [82]. The study also revealed that the facial skin preparation containing the red dragon fruit including antioxidant, vitamin C, and vitamin E are proven to accelerate the healing of acne. Apart from curing acne, this can also brighten dry and dull skin [83]. Hence, it can be used for skin care preparations.

q. *Solanum lycopersicum*

Tomato (*Solanum lycopersicum*) fruit is the major source of lycopene and it is quite rich in varieties of bioactive compounds which is reported for its antioxidant activity. Thus, it is used in the cosmetic and pharmaceutical fields [84]. Many of these compounds are rich in nutrients including vitamin C, potassium, and essential amino acids, and possess various antioxidants and anti-inflammatory properties [85]. It is reported that lycopene present in tomatoes scavenges lipid radicals, reduces lipid peroxidation, and prevents erythema caused by UV radiation on the skin [86]. Thus, tomatoes can be used in various cosmeceutical formulations.

r. *Garcinia Mangostana* L. (Mangosteen)

Mangosteen (Garcinia Mangostana L.) is a tropical fruit, indicating its significance and potential usefulness in the research field [87]. It is rich in potent bioactive compounds, such as xanthones. Apart from xanthones, mangosteen also contained benzophenones, flavonoids, and anthocyanins [88]. It is reported that it contains bioactive compounds that function as anti-oxidants, anti-acne, anti-aging, antibacterial, and anti-inflammatory [89]. Therefore, it can be valuable for various cosmeceutical preparations.

s. *Avena Sativa*

Avena Sativa commonly called “oats” is a popular functional cereal grain because of its therapeutic properties [90]. It is stated that oats contain numerous phytoconstituents such as carbohydrates (β-glucan), phenolic acid derivatives, tocopherol, vitamin E, amino acids, saponins, flavonoids, and lipids [91]. Research shows that it has anti-oxidants, anti-inflammatory, anti-allergenic, anti-carcinogenic, absorbent, and skin conditioning properties along with this, it is also effective for de-pigmentation which makes them a potential ingredient to be used in various therapeutic preparations [92,93].

t. *Prunus Dulcis*

Prunus Dulcis is also known as “Almond” or “Sweet Almond” a well-known tree nut (dry, edible, one-seeded fruits enclosed in a hard outer covering) that is used in herbal medicine for its therapeutic effect [94]. Recent studies have shown that nut has many nutritious ingredients such as fatty acids, lipids, amino acids, proteins, carbohydrates, vitamins, minerals, and secondary metabolites [95]. It is reported that it has several pharmacological activities including, anti-microbial, anti-inflammatory, and antioxidant and it also has sun protective properties which make them valuable in cosmetic preparation [96,97].

u. *Foeniculum Vulagare*

Foeniculum Vulagare commonly known as “Fennel” is a perennial herb with therapeutic properties [98]. Phytochemical studies have shown the presence of some valuable compounds such as amino acids, alkaloids, carbohydrates, phenols, flavonoids, etc. [99]. Recent research has shown some pharmacological activities such as anti-bacterial, anti-fungal, and anti-inflammatory, along with this it acts as an excellent anti-oxidant due to the presence of high content of phenols and flavonoids which make them very useful ingredient to be used in various skin care preparation [100,101].

v. *Portulaca oleracea*

Portulaca oleracea L. (PO), called "purslane" is an annual grassy plant with a plump stem, leaves, yellow or white small flowers, and black seeds. It is used as a pot-herb (herbs grown for culinary use) in Mediterranean, European, and Asian countries and it is also listed as one of the most useful medicinal plants. It also possesses flavonoids, coumarins, monoterpene glycosides, phenolic compounds, fatty acids, alpha-linolenic acid (Omega-3), alkaloids, vitamins, and minerals [102]. Recent studies have shown that it is traditionally used for therapeutic purposes as it contains anti-microbial, anti-oxidant, and anti-inflammatory properties [103,104]. It has also been stated that it is used for minimizing sunburn, and tanning, it also helps in exfoliation, in removing scars and blemishes which makes it a potential herb to be used in different skincare [105].

w. *Melissa officinalis*

Melissa officinalis L is commonly called "lemon balm", "bee balm", "honey balm" etc. is an aromatic and perineal herb [106]. It has been stated that the fresh herb contains phenolic compounds, L-ascorbic acid, carotenoids, terpenoids, and flavonoids such as luteolin, apigenin, hesperidin, naringin, catechin, epicatechin, rutin, quercetin, myricetin, quercitrin, rhamnocitrin, and iso-quercitrin [107,108]. Recent studies revealed that it has a high content of rosmaric acid, and tyrosinase inhibitory activity higher than arbutin which makes it an effective anti-oxidant, anti-inflammatory and skin whitening ingredient to be used in skin care preparations [109].

x. *Pongamia Pinnata*

Pongamia Pinnata (L.) is commonly called as "Maktamala" or "Gaura" in Sanskrit and "Indian Beech" in English. In Ayurveda and Siddha systems it is used for the treatment of various skin diseases, and it is classically categorized in Charaka Samhita as "Kandughna" which means an herb that gives relief from itching [110,111]. Studies have revealed that it contains chemical compounds belonging to different groups such as alkaloids, proteins, tannins, glycosides, steroids, saponins, and flavonoids [112]. It is stated that the plant extract of Indian beech consists of different physiological properties such as anti-inflammatory, and anti-oxidants, along with this the extract of leaves of this herb shows good absorbance through the UVA region which makes them a valuable ingredient to be used in skincare and protecting preparation [113,114].

Table No. 1 Botanical Name, Image, Common Name, Family, Part Used, Chemical Constituents, Uses of Natural Cosmeceuticals for skin care preparations.

Sr. No	Botanical Name	Image	Common Name	Family	Part Used	Chemical Constituents	Uses	Ref.
1.	*Hemidusmus Indicus*	 Fig: Anantmool	Anantmool	*Apocynaceae*	Root	Hemidesmol, Resin and Glucoside, Tannins, Resin, Lupeol Acetate, B- Amyrin Acetate; Hexa-Triconate Acid, Lupeol 1-Octacosanol, Steroid, Terpenoids, Flavonoid Saponin	Anti-Bacterial and Anti-Inflammatory Properties.	[115]
2.	*Arctium Lappa* L	 Fig: Burdock	Burdock	*Arctium*	Root	Amino Acids, Polysaccharides, Phenolic, Vitamins, Caffeoylquinic Acid, Derivatives	Anti-Oxidative, Anti-Inflammatory Anti-Microbial Activities	[116, 117]
3.	*Panax Ginseng* C.A. Meyer	 Fig: Ginseng	Ginseng	*Araliaceae*	Root	Ginsenosides, Alkaloids, Glycosides, Polysaccharide, Polypeptides	Anti-Aging, Anti-Inflammatory, Anti-Bacterial	[118, 119]

4.	*Rhodiola Rosea* L	 Fig: Rose Root	Rose Root	*Crassulaceae*	Root	Phenyl Propanoids, Phenyl Enthanolic Compound, Flavonoids, Monoterpenes, Phenolic Acid	Antioxidant, Anti-Inflammatory	[120, 121]
5.	*Rubia Cordifolia* L	 Fig: Manjishtha	Manjishtha	*Rubiaceae*	Root	Anthraquinones, Anthraquinones, Alkaloids, Steroids, Flavones, Flavonoids, Phenols, Saponins, Tannins, Proteins, Glycosides	Anti-Bacterial, Anti-Inflammatory Properties	[122, 123, 124]
6.	Cinnamonium Zeylanium Blume	 Fig: Cinnamon	Cinnamon	*Lauracece*	Bark	Cinnamaldehyde, Bugenol	Antti-Inflammatory, Antioxidant, Anti-Microbial	[125, 126]
7.	*Acacia Catechu* (L.f.)	 Fig: Cutch Tree / Khair	Cutch Tree / Khair	*Fabaceae*	Bark	Alkaloids, Carbohydrates, Flavonoids, Tannins, Steroids	Antioxidant, Anti-Inflammatory, Astringent, Anti-Bacterial, Anti-Fungal.	[127, 128, 129]
8.	*Albizia Lebbeck* (L) Benth	 Fig: Lebbeck	Lebbeck Tree	*Fabaceae*	Bark	Oleic Acid, Palmitic Acid, Capric, Lauric Acid, Myristic Acid, Stearic Lineolic Acid With N-Tritri-Contane, B-Sitosterol, Phenolic Compounds, Flavonoids	Antioxidant, Anti-Microbial	[130]
9.	*Aloe Barbadensis* Miller	 Fig: Aloe vera	Aloe vera	*Asphodeleaceae*	Leaf	Alkaloids, Flavonoids, Carbohydrates, Proteins, Saponins, Phenols, Terepenoids, Phytosterols, Anthroquinones	Anti-Bacterial, Antifungal	[131, 132]
10.	*Camelia Sinesis*	 Fig: Green Tea	Green Tea	*Theaceae*	Leaf	Catechin, Tannins, Theaflavin, Vitamines, Sapoin, Minerals, Carbohydrates, Lipids.	Anti-Microbial, Anti-Bacterial, Antioxidant	[133, 134]
11.	*Eucalyptus*	 Fig: Eucalyptus	Eucalyptus	*Myrtaceae*	Leaf	Saponin, Tannins, Steroids, Flavonoids	Anti-Microbial, Anti-Inflammatory, Antioxidant	[135, 136]

12.	*Oneothera* L.	 Fig: Evening Primprose	Evening Primprose	*Ongraceae*	Flowe r	Alkaloids, Esters, Carboxylic Acid, Alcohol	Anti-Aging, Anti-Inflammatory	[137, 138]
13.	*Calendula Officinalis*	 Fig: Pot Marigold	Pot Marigold	*Asteraceae*	Flowe r	Saponins, Oleanolic Acid, Stigmasterol, Carotenoids, Amino Acids	Anti-Inflammatory , Anti-Microbial, Wound and Burn Healing, Prevent UV Radiation	[139]
14.	*Malva Sylvestris*	 Fig: Mallow	Mallow	*Malvaceae*	Flowe r	Flavonoids, Phenoilc Compounds, Lipids	Anti-Microbial, Anti-Inflammatory , Antioxidant	[140]
15.	*Achillea Millefolium*	 Fig: Yarrow	Yarrow	*Asteraceae Dumort*	Flowe r	Alkaloids, Glycosides, Choline, Salicylic Acid, Sesquiterpenoids	Anti-Inflammatory	[141]
16.	*Hylocerus Undatus*	 Fig: Dragon Fruit	Dragon Fruit	*Cactaceae*	Fruit	Protein, Steroids, Carbohydrates, Alkaloids, Phenolic Compounds, Tannins, Flavonoids, Saponin	Antioxidant, Anti-Microbial, Wound Healing	[142, 143]
17.	*Solanum Lycopersicum* L.	 Fig: Tomato	Tomato	*Solanceae*	Fruit	Phenolic Compounds, Carotenoids, Ascorbic Acid, Vit A, Tomatine	Antioxidant, Anti-Inflammatory	[144, 145]
18.	*Garcinia Mangostana* L.	 Fig: Mangosteen	Mangosteen	*Clusiaceae*	Fruit	Xanthones, Terpenes, Anthrocyannins, Tannions, Phenols	Anti-Bacterial, Anti-Fungal, Wound Healing, Anti-Inflammatory , Antioxidants	[146]
19.	*Avena Sativa*	 Fig: Oats	Oats	*Poaceae*	Seeds	Amino Acids, B-Carotene, Polyphenols, Flavonoids	Antioxidants, Anti-Inflmmatory	[147, 148]

20.	*Prunus Dulcis* Miller D A Webb	 Fig: Almond	Almond	*Rosaceae*	Seeds	Fatty Acids, Lipids, Amino Acids, Proteins, Carbohydrates, Vitamins, Minerals, Flavonoids	Anti-Microbial, Antioxidants, Anti-Inflammatory	[149, 150]
21.	*Foeniculum Vulgare*	 Fig: Fennel	Fennel	*Apiaceae*	Seeds	Amino Acids, Alkaloids, Carbohydrates, Phenols, Flavonoids	Antioxidant, Anti-Bacterial, Anti-Fungal, Anti-Inflammatory	[151]
22.	*Portulaca Oleracea*	 Fig: Purslane/ Mhotighol	Purslane/ Mhotighol.	*Portulaceae*	Herb	Ascorbic Acid, A-Tocopherols, Omega-3 Fatty Acids, Apigenin, Gallo Tannins, Quercetin,Kaempferol	Antioxidant, Antimicrobial, Anti-Inflammatory.	[152, 153]
23.	*Melissa Officinalis* L	 Fig: Lemon Balm	Lemon Balm	*Lamiaceae*	Herb	Phenolic Compounds Such as Thymol, Carvacro.	Antioxidant, Antimicrobial, Anti-Inflammatory,	[154]
24.	*Pongamia Pinnata* (L.)	 Fig: Indian Beech	Indian Beech	*Fabaceae*	Herb	Alkaloids, Tannins, Steroids, Glycosides, Flavonoids	Anti-Inflammatory, Antioxidant, Anti-Fungal	[155]

IV. CONCLUSION

Cosmeceuticals are the fastest-growing segment that has evolved over recent years. Constant product formulation and development are required to compete and meet consumer preferences. Cosmetics and skin care products are consumed all over the world, and the side effects derived from the use of cosmetics pose health risks mainly due to exposure to numerous chemical substances. The demand is increasing for natural cosmetics over synthetic cosmetics. The following plant parts are root, bark, leaf, flower, fruit, seed, and whole herbs used in cosmetics not merely to enhance beauty but also to have medicinal properties. Cosmeceuticals are cosmetic-pharmaceutical products intended to improve the health and beauty of the skin and body by providing a specific ranging from antioxidant, anti-inflammatory, antimicrobial, antibacterial, antifungal, wound healing, antiperspirant, skin whitening, anti-aging, anti-photo aging**,** and antiseptic properties. The above-discussed medicinal plants in this chapter contain chemical constituents such as steroids, saponins, flavonoids, terpenoids, coumarin, tannins, vitamins, volatile oils, tocopherols, fatty acids, and polyphenols which are responsible for medicinal effects in cosmeceutical preparation and which may play a potential role in cosmeceutical products in future.

V. FUTURE SCOPE

The knowledge of medicinal plants used by the people has been well-known in its culture and tradition in medicine and cosmetics for centuries. The secondary metabolites are continually gaining popularity, and the use of plant

extracts in cosmetic formulation is on the rise. In the present scenario, the use of cosmetics has become such a necessity that one can hardly avoid their use. Cosmetic products are the best option for reducing skin problems like hyperpigmentation, skin wrinkling, skin aging, eczema, psoriasis, acne, moles, fungal infections, rosacea, vitiligo, seborrheic dermatitis, rough skin texture, and skin cancer, etc. The bioactive ingredients of medicinal plants discussed in this chapter can actively help to improve the skin appearance or support traditional ingredients in their action to cure various dermatological disorders and have significant potential for cosmeceutical preparation.

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