

Chapter 19

The Importance of Natural Products in Cosmetics



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Abstract People from worldwide have been using plant-based substances (Natural Products) to enhance the appearance since the existence of mankind. In the ancient Egypt, around 3000 BC, there is evidence of using cosmetics, and their usages have been a necessary part in our everyday life in all cultures. Initially, natural products have been used for beauty products; occasionally augment with paints and dyes. Natural products have approached back with present trend cosmetic products which are mainly derived from plant sources. Since from longer time, plant products (Natural Products) are source of food and medicines. A broad range of natural products is used in cosmetics preparations, skin care such as treatment of dryness, treatment of eczema and acne, as well as antioxidant, anti-inflammatory, anti-aging, hair care products such as hair growth imputes, hair color, scalp complaints like dandruff, and skin protection, and also toiletry preparations. Essential oils are major source of plants; essential oils have been used in preparation of perfumes, hair care substances, emollient of the skin. For example, natural products have been used in cosmetic industry avoiding side effects with traditional preparations for herbal beauty such as *Embllica officinalis* (Amla), *Acacica concinna* (Shikakai), and *Callicarpa macrophylla* (Priyangu) have been used strongly in skin care and hair care. Moreover, Indian women are still using natural products such as *Pterocarpus santalinus* L. and *Curcuma longa* (skin care), *Lawsonia inermis* L. (hair color), and natural oils such as coconut, olive, shea butter, jojoba, and essential oils in perfumes for their bodies. The present book chapter represents the importance of natural products in cosmetics.

Keywords Natural products • Herbs • Cosmetics • Essential oils

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19.1 Introduction

Since the ancient times, humans from all advancements have been using infinite substance as a source to improve their beauty, looking younger, enhance their sexiness, and normally protect their health (Freitas et al. 2015). The substances used commonly nowadays for these momentums are generally known as cosmetics and cosmeceuticals (Freitas et al. 2015). Normally, cosmetics do not consist of pharmacologically active substances, at the minimum level, and do not demonstrate the amount of benefit of skin scientifically (Freitas et al. 2015). Moreover, in comparison with the classic cosmetics, they are safe, universally available from supermarkets, medical shops, beauty salons, and online traders. Classic cosmetic products include maquillage, toothpastes, conditioners and shampoos, hair colors, nail enamel, perfumes, and antiperspirant (Joshi and Pawar 2015; Wanjari and Waghmare 2015).

Cosmeceuticals, also known as cosmedics or cosmedicals, are skin care substances with active natural products with the therapeutic or drugs like interest includes cosmetic property (Joshi and Pawar 2015; Wanjari and Waghmare 2015). The skin care substances methodological demonstrate measures that productive affects the skin and are issued by the functional substances (Joshi and Pawar 2015; Wanjari and Waghmare 2015). Cosmetics could summon constructional adjustments in pores and skin and beneficial outcomes in skin situations including blackheads, pimples, hyperpigmentation, and rosacea (Joshi and Pawar 2015; Wanjari and Waghmare 2015). Although cosmeceuticals are not considered as medicines or pharmaceutical substances, so they don't require any prescription to omit, and they could be used frequently without risk and major side effects (Joshi and Pawar 2015; Wanjari and Waghmare 2015). Cosmeceuticals of herbs and artificial substances and their derivatives include antioxidants, antidandruff, vitamins, shampoos, antifungal compound, sunscreen lotions for sun protection factor, anti-acne, anti-wrinkle, anti-aging, toothpastes, and deodorants that contain antiperspirants (Freitas et al. 2015; Joshi and Pawar 2015; Wanjari and Waghmare 2015). Natural products such as haldi, chandan, manjistha, yastimadhu, khas, and nagkleshara are used to gleam complexion; while arusa, amala bavchi, guduchi, and chakmarad are mentioned as kustaharan (Kuno and Matsumoto 2004). Moreover, natural products such as haridra, khadira, vidyanga, amalaki, abhaya, jatisaptaparna, karacira of various promises from Knahshthag and Mahakashiya are mentioned productively for skin disorder. Charak and Sages stated natural products are used to remove toxins from the body, clear the entangled that conduct grow on the skin and also secured from kushtha and boils (Kuno and Matsumoto 2004). For example, natural products such as Eladi Gana contain ela, kusstha, tagar, jatamani, tvak, dhmamaka, potra harenuka, shutki, stuuneyaka, choraka, guggol sarjarasa, agaru, devedaru, and padmakasher.

As per 1989 safety regulations, consumer substance or substance deliberate application should be used on the outermost surface of human body which includes lips, nails, hair system, epidermis, and external medicine, as well as denticle,

mucous membrane for wash, fragrances used for protecting from bad smell for the determination of treating and stopping disease (Zuorro and Lavecchia 2010).

Novel natural active chemical constituents are derived from the plant kingdom, earth, and sea. Approved active chemical constituents include vitamins, food fibers, minerals, enzymes, hormones, antioxidants, multitude of naturals, and Chinese herbs. Historically, natural products have been used commercially, and till now, several new natural products consist of natural oil and herbs that are available in the market. In cosmetics, plants are the major source and base. Furthermore, natural products are used as drugs in pharmaceutical industry, but they are not acceptable to be used as cosmetics products. According to the cosmetic safety regulatory act in 1989, *Atropa belladonna* and *Digitalis purpurea* plant materials were forbidden (Zuorro and Lavecchia 2010). Natural product complete extracts and specific extracts have been used in cosmetics. Total natural products and specific extracts are employed which are the major cause of determination of their specific activities. Some selective natural products were applied in different zone of use, for example, *Glycyrrhiza glabra* for skin annoyance; *Ginkgo biloba* as antioxidant; *Berberis vulgaris* as skin glowing (Zuorro and Lavecchia 2010). Natural products are major source to make soaps such as *S. officinalis* (soapwort) in Europe; *Y. glauca* (yucca) in southern USA; *S. indica* as soapnut in India; *Phytolacca dodecandra* L., and *Quillaja saponaria* L., in Africa and America, respectively (Zuorro and Lavecchia 2010). This is extremely interesting to know how plants are differing from other plants used which differ from tree bark to berries. The present chapter represents the importance of natural products in cosmetics and cosmeceuticals.

19.2 Background

In Africa Homo sapiens, over 100,000 years ago, African Middle Stone Age discovered the red bister including crayons are the application of cosmetic body (Murube 2013). An additional proof in ancient Egypt, about 10,000 BC, humans used scented oil, lotions to clean, skin soothe, and mask their body odor (Murube 2013). Then, about 3,000 BC, the use of cosmetics such as hair and skin care products became more common in Egypt and also expanded to large parts of Asia and Africa (Hetta 2016a, b; Murube 2013). Historically, women and men were applied kohl—as eye makeup which also protects the eyes from dry winds and sun radiation (Hetta 2016a, b; Murube 2013). Castor oil skin lotions and creams were prepared and used for the skin protection. Also, extracts from red algae for abrade lipsticks; sometimes from fish scales to obtain the glittering substance and crunch on *Glycyrrhiza glabra* root sticks to improve their breath. Silent basic natural active ingredients such as almond oil, sesame oil, lily, rosemary, peppermint, rose, aloe, lavender, chamomile marjoram, and thyme oils were used in perfumes (Hetta 2016a, b; Murube 2013).

Around 100 AD, Ancient Rome traditionally used makeup and beauty products. It was their trend and faith that became a necessary part of their daily life

(Blanco-Dávila 2000). Beauty products like body lotions, eyeshadow, liners, talcum powders, nail products, perfumes, and toothpaste products were used by women in Roman daily and also beauty masks to make their faces glow, while Roman men were used it as hair dye. Particularly, women's social status, attractiveness, wealth, clothes, makeup embellish in. In 215 BC, *Lex Oppia* established a law extravagance to control gorgeous and luxurious; women could purchase and wear (Hsieh et al. 2016; Naidoo et al. 2016; Stutesman 2016; Watson 2012). After six years, this law was reversed; but people from Ancient Rome took cosmetics to new heights and limits. Now, in Milan, there are the largest beauty empires in the world.

Prior to twentieth century, about the year 1910, cosmetics were used more in fashion in Europe and USA. In 1910, in Paris, they introduced color makeup. Hence, in 1920s, film industry introduced in Hollywood had an advanced influence on cosmetics (Jones 2011). Theda Bara was a great movie star of the silent movie period, and her makeup artist has been developing the cosmetics production (Jones 2011). In 1920s, the cosmetic substances were highly demanded to inculcate consciousness in American women. The conduct among others to the wing variety which was identified by fearless dark eyes, red nail polish, red lipstick, eyebrow pencil, mascaras artificial hair color, brownish sunscreens (Murnen and Seabrook 2012; Schlessinger 2007). In the entire world, cosmetics were shortsupply between 1939 and 1945 during the Second World War. During this war, important part owed to the fact that alcoholic and petroleum products are the best active ingredients of several cosmetic products.

The late twentieth century, between 1960 and 1970s, women in the western world used the cosmetic products desert to cheapen women to sex objects (Oréal 2015). In 1970s, it was a trend to develop the natural looking products. Coincidentally different lipstick colors (like green, red lilac, silver, and pink), non-allergenic cosmetics makeup powders with longer staying have been developed (Oréal 2015), and also males started to use cosmetics to improve facial features (Ribeiro et al. 2015). They have been developed the most popular cosmetics such as mask for dark circles, age spots, and blemishes on the skin and large pores on the skin (Ribeiro et al. 2015).

Cosmetics and cosmeceuticals industries have a large market worldwide which was estimated over 200 billion US dollars in the year 2015 (Chaudhri and Jain 2009; Ribeiro et al. 2015). This might be qualified to increase in world economy, changing the way of life, increasing utilization and personal skin and hair care of new commercial naturally developed substances. Worldwide in the main retailers, 36.9% of share is from Asia and Pacific regions, and share from America, Europe, Africa, and Middle East holds 30.8%, 29.5%, and 2.9%, respectively (Chaudhri and Jain 2009). In global markets, accounted skin, hair, makeup, fragrances, and hygiene products are 36.3%, 22.9%, 18.2%, 12%, and 10.5%, respectively. These cosmetics and beauty products are usually purchased from online stores, retail shops, supermarkets, drug stores, departmental stores, and brand outlets (Chaudhri and Jain 2009).

19.3 From Past to Future

A modern development of cosmetics and cosmeceuticals industry is the natural beauty products (Atanasov et al. 2015). Since ancient times, extracts from various parts of aromatic and medicinal plants are introduced in cosmetics and cosmeceutical products (Barbulova et al. 2015; Kapoor 2005). Around early 1900s, naturally a derived product adequately increases in cosmetics and cosmeceuticals industry (Jones 2011; Kapoor 2005). Currently, organic substances or products are more on demand throughout the world as the utilizing of natural products at low risk of undesirable effects (Carola et al. 2012).

19.4 Source of Natural Products

Natural products are generally acquired from aromatic and medicinal plants, mixture of volatile and nonvolatile chemical constituents with strong odor (Bakkali et al. 2008). Natural products are considered as one of the most control plant products in agriculture, as they exhibit antiviral, antibacterial, anti-cancer, antioxidant, antidiabetic, insect repellent, antifungal, anti-inflammatory, and cosmetic properties (Reddy 2019; Said et al. 2016; Swamy et al. 2016). For example, from willow tree bark, *Digitalis lanata* flowers and opium medicinal products derived as aspirin, digoxin, and morphine, respectively, and also extracted from *T. indica* and *S. alata* areal parts and seeds contains polyphenols, flavonoids, and hemicellulose xyloglucan that were used for skin protection from sun radiation. Leaf extracts from *T. serrulata* (Vahl) have been used for treatment for hair growth and hair loss (Freitas et al. 2015). Essential oils extracted from *L. aestuans* are used as facial toners, lotions, lip balms, ointments, creams, scrubs, massage oils, masks, and shampoos for antidandruff and also used for treatment for eczema, acne, chicken fox, insect bites and scarring from burns (Reddy 2019). *M. oleifera* leaf and seed oil extracts contain considerable amount of β -carotenes, vitamins A, C, & E, and polyphenols using anti-inflammatory and antioxidant activities also have been used for body oils, scrubs, lotions, balms, creams, hair care, moistures sun protection, and perfumes (General Bureau of statistics 2014). Some of these plants were used for traditional use because monoterpenes, sesquiterpenes and triterpenoids and phenolic compounds are present. For example, *P. amboinics* consist of mono, di, and sesquiterpenes which are used for antioxidant, anti-inflammatory, antimicrobial, skin cleansers, anti-wrinkle, anti-skin cleansers, anti-aging night creams, and cosmetics also used for itchy skin and insect bite (Freitas et al. 2015; Kleynhans et al. 2017). *A. indica* L. oils extracted from fruits and seeds are used for preparing soaps, creams, balms, shampoos, nail polishes and toothpastes (Mans et al. 2017; Nagarjuna et al. 2017). These essential oils could be used as perfumes, flavoring agents, fragrances for different cosmetics and cosmeceuticals (Swamy et al. 2016).

19.5 Extraction and Isolation of Natural Products or Essential Oils

Natural products or volatile oils extracted by using different methods could be applied for essential oil extraction, such as steam distillation, hydro distillation, solvent extraction, or continuous extraction such as Soxhlet extraction, liquid–solid extraction, liquid carbon dioxide, microwave extraction. Generally, for essential oil extraction hydrodistillation or steam distillation quintessential is used, resulting in less molecular weight, mixture of chemical constitutes is obtained. For example, Lamiaceae and Citrus families have used steam and hydrodistillation. For extraction of natural products, Soxhlet extraction and liquid–solid extraction quintessential are used, resulting in high molecular weight of the compound.

All these natural products and essential oils are mixtures with the other chemical constituents from the natural sources; the products must be isolated and purified. Isolated purified compounds are acquired in milligrams to grams. After extraction, natural products or essential oils are isolated using these methods by adsorption, precipitation, chromatography, and crystallization methods, etc. After isolation product needs to study chemical and physical properties, chemical structure elucidation, and structural activity of relationship of the product.

19.6 Plants-Derived Cosmetics and Cosmeceuticals

A rich and diverse traditional medicinal system has been employed for traditional medicine using different variety of plants worldwide. The uses of these plants in the world thoroughly have been addressed by Raghoenandan (Hindustani), van't Klooster (Maroons), van Adel and Ruyschaert (Creoles), and Tjong Ayong (Javanese) (Raghoenandan 1994; Tjong Ayong 1989; Van Andel and Ruyschaert 2011; Van't Klooster et al. 2016). Around 789 medicinal plants have been published in the Surinamese, among 10% (\approx seventy two) of plants were used for the purpose of cosmetics and cosmeceuticals. Among seventy-two plants, three quarter (fifty eight) is used cosmeceuticals for treating scars, warts, pimple, pigment skin, scaly skin, skin vexation, inflammation, pustules, and boils as well as skin fungi and skin parasites. These properties indicated plants have significant cosmaceuticals and medicinal properties. More than twenty-five plant families are belonging to the cosmeceuticals, which are recommended for treating the skin-related problems. More than 20% of medicinal plants have been used for cosmetics and cosmeceuticals which include perfumes, skin care, hair care, refreshment and steam bath and some of the cosmetics and cosmeceutical plants as shown in Table 19.1.

Table 19.1 Plants used for cosmetics and cosmeceuticals

Plant Scientific name	Condition
<i>P. guajava</i> L.	Body odor
<i>T. serrulata</i> (Vahl.)	Genital steam baths
<i>E. hieracifolia</i> (L.), <i>S. alata</i> (L.)	Flaky skin
<i>M. maripa</i> L., <i>M. citrifolia</i> L., <i>B. excels</i> L.	Hair care
<i>M. indica</i> L., <i>M. micrantha</i> , <i>S. trilobata</i> , <i>U.camphorata</i> , <i>M. charantia</i> L., <i>S. alata</i> L., <i>A. indica</i> , <i>A. Juss</i> , <i>C. odorata</i> L., <i>C. citrates</i> , <i>Citrus</i> sp., <i>Cecropia</i> sp.	Local skin lesions (e.g., boils and pustules)
<i>B. orellana</i> L., <i>Z. mays</i> L.	Makeup
<i>Sida rhombifolia</i> L. <i>Cedrela odorata</i> L.	Pigment spots
<i>A. vera</i> L., <i>C. odorata</i> L., <i>A. galanga</i> L.	Scars
<i>E. foetidum</i> L., <i>C. nucifera</i> L., <i>E. oleracea</i> , <i>M. maripa</i> , <i>M. citrifolia</i> L., <i>L. aestuans</i> L.	Skin care
<i>A. sativum</i> L., <i>L. purpureus</i> L., <i>S. alata</i> L., <i>S. reticulate</i> L.	Skin fungi
<i>P. stellis</i> , <i>L. aestuans</i> L.	Skin rejuvenation
<i>P. amboinicus</i> Lour. <i>G. barbadense</i> L., Orchid spp.	Skin refreshment
<i>Amaranthus</i> sp., <i>C. nucifera</i> L., <i>C. odorata</i> L., <i>E. prostrata</i> L., <i>M. micrantha</i> Kunth, <i>R. fruticosa</i> L., <i>U. camphorata</i> L., <i>O. cochinelifera</i> Steud., <i>V. guianensis</i> , <i>C. sativus</i> L., <i>J. curcas</i> L., <i>R. communis</i> L., <i>C. guyanensis</i> Desf., <i>S. alata</i> L., <i>T. indica</i> L., <i>B. guianensis</i> Aubl, <i>C. alatus</i> Aubl, <i>C. ramosa</i> Aubl, <i>M. glabra</i> L. <i>A. moschatus</i> Medik., <i>A.purpurascens</i> Aubl, <i>A. indica</i> , <i>A. Juss</i> , <i>C. odorata</i> L., <i>A. bilimbi</i> L., <i>P. coccinea</i> Aubl., <i>O. sativa</i> L., <i>Q.amara</i> L., <i>C. latifolium</i> Lam., <i>S.leucocarpon</i> Dual., <i>S. stramonifolium</i> Jacq., <i>W. indica</i> L., <i>L. rosea</i> , <i>A. galanga</i> L.	Pimples
<i>A. curassavica</i> L., <i>P. acuminata</i> Ait., <i>C. difussa</i> Burm.f.	Warts
<i>B. pinnatum</i> (Lam), <i>G. barbadense</i> L.	Warts
<i>E. prostrata</i> L., <i>M. micrantha</i> Kunth., <i>U.camphorata</i> L., <i>C. cujete</i> L., <i>B. orellana</i> L., <i>T. ulei</i> Vaupel., <i>C. difussa</i> Burm.f., <i>C. urens</i> L., <i>M. guianensis</i> Aubl, <i>S. alata</i> L., <i>L. nepetifolia</i> L., <i>O. tenuiflorum</i> L., <i>A. moschatus</i> Medik., <i>A. indica</i> , <i>A. Juss</i> , <i>C. guianensis</i> Aubl., <i>C. odorata</i> L., <i>F. schumacheri</i> , <i>P. marginatum</i> Jacq.	Skin irritation (e.g., rash, dermatitis, and eczema)
<i>U. camphorata</i> L., <i>C. guianensis</i> Aubl.	Skin parasites

19.6.1 Manufacture of Plant-Derived Cosmetics and Cosmeceuticals

Based on the earlier abundant plant, raw material could be processed into cosmetics, cosmeceuticals, and medicinal preparations. As a result in the worldwide increasing number of entrepreneurs such as individuals, small, medium, and large scale gross on medicinal plants sector. Hence, either collecting or cultivating the

raw materials themselves they act as retailers or mediator or supplier for processing or preparation of cosmetics or cosmeceuticals intermediates or final products (Playfair et al. 2011). For example, in Suriname Skin Glanz cosmetics Odany Jewa, and Jomi cosmetics are specialized in skin care-related cosmetics and cosmeceuticals from start. These include scrubs, face washes, liver spots, eye bags, day and night creams, ointments, removal of impurities on the skin and facial cleaners, etc. (Grant 2017). However, while using the cosmetics/cosmeceutical materials caution and possible side effects such as photosensitivity and skin allergy are perfectly mentioned in the user instructions (Grant 2017).

Cosmetics and cosmeceuticals are usually produced from different fresh plant parts such as leaves, fruits, barks, seeds as well as unfinished substances such as waxes and vegetable oils from plants as shown in Table 19.2. The acquire plant raw materials are from growers, collectors, and vendors who mainly operate in different places in the world. Hence, plants of these parts grow easily and persistently encountered in the wild. *L. aestuans* is an exception West Indian wood nettles relatively rare (Grant 2017). Extraction of other important constituents such as oils are complicated process from these plants such as *C. nucifera* (coconut tree), *C. guyanensis*, *V. paradoxa* (shea butter), *A. chinensis* (jojoba oil), and *C. guianensis*.

Table 19.2 Plants used for preparation of cosmetics and cosmeceuticals

Family	Plant Scientific name	Use of cosmetics/ cosmeceuticals
Asphodelaceae	<i>A. vera</i> (L.)	Skin care products
Arecaceae	<i>C. nucifera</i> L., <i>E. oleracea</i> Mart., <i>M. maripa</i>	Skin, Hair, and Eye care products
Asteraceae	<i>E. prostata</i> L.	Skin care products
Crassulaceae	<i>B. pinnatum</i>	Skin care products
Cucurbitaceae	<i>C. sativus</i> L.	Skin care products
Commelinaceae	<i>T. serrulata</i> L.	Hair care products
Fabaceae	<i>C. guyanensis</i>	Eye and hair care products
	<i>S. alata</i>	Deep skin cleaners
	<i>T. indica</i> L.	Skin care products
Lecythidaceae	<i>B. excelsa</i>	Hair and skin care products
Lamiaceae	<i>L. nepetifolia</i>	Eye care products
	<i>P. amboinicus</i>	Skin care products
Moringaceae	<i>M. oleifera</i>	Skin care products
Malvaceae	<i>H. sabdariffa</i>	Skin and hair care products
Meliaceae	<i>C. guianensis</i>	Eye, Hair and Skin care products
Orchidaceae	Orchid spp.	Skin care products
Poaceae	<i>C. citratus</i>	Skin care products
Urticaceae	<i>L. aestuans</i>	Skin care products
Rubiaceae	<i>M. citrifolia</i>	Hair and skin care products

19.6.2 *Substances of Plant-Based Cosmetics and Cosmeceuticals*

The most frequently used plants in cosmetic and cosmeceuticals are shown in Table 19.2. There are some plant leaves especially for facial washes such as *A. indica*, *A. vera*, *M. oleifera*, *C. citrates*, and *Y. indica*. *C. citrates* and *P. amboinicus* leaves are used for facial milks. The leaves and fruit juices of these important plants such as *E. oleracea*, *C. sativus*, *M. citrifolia*, *A. indica*, *C. nucifera*, *T. indica*, and *H. subdariffa* L. are used to synthesis day and night skin lotions. To remove dead skin cells, stimulate blood circulation and facial scrubs *E. oleracea* fruit granules are used mainly and also for deep skin cleaning *E. prostate*, *S. alata*, and *T. indica* essential components of leaf juices are used. *M. pleifera* and *L. aestuans* leaves extracts contain active ingredients for treating eczema, chapped lips, insect bites, and acne, also leaves extracts of *T. serrulata* are used for treating hair growth. Particularly most of the above-mentioned plant extracts are used for skin care creams, lotions, and scrubs. Oils extracted from leaves, fruits, and bark from these plants *B. excels* (Brazil oil), *C. nucifera* (coconut oil), *C. guianensis* (karapa oil), *M. maripa* (maripa oil), and *C. guyanensis* (hoped oil from bark) are used for treating hair growth and hair care products. *A. indica*, *B. pinnatum*, and *L. nepetifolia* leaves extracts are used eye masks, ointments, and treating eye bags and acne. Significant unfinished products such as shea butter, grapeseed oil, jojoba oil, coconut oils are used for preparing hair care, skin care, soaps, moisturizers and sunscreens, hair conditioners, anti-wrinkle formulations, hair conditioners, ointments, baby oils, skin inflammation, and juices extracted from *A. indica* and *P. amboinicus* are commonly used for preparations of facial masks.

Some of the above indicated medicinal plants used for cosmetics and cosmeceuticals and their plants phytochemical composition are widely presented in Table 19.3. Few of the plants are summarized below, for example,

***Aloe vera* (L) Burm.f.**

This plant is mainly used in traditional medicinal treatment of microbial infections, skin conditions, constipation, and diabetic mellitus (Manvitha and Bidya 2014; Mahor and Ali 2016). This indicates that leaves of *A. vera* extracts contain significant therapeutic agents such as polymannans, lectins, anthraquinones, and acetylated mannans (Hamman 2008; Moghaddasi and Verma 2011); that's why the leaf gels are included in soft drinks and dilatory additives for digestion (Eshun and He 2004; Qadir 2009). It is moreover used in sunburns, ointments, shampoos, conditioners, skin lotions, sunscreens, facial tissues, soaps, makeup, moisturizers, and shaving creams which are used for the main applications for smoothing and moisturizing effects of *A. vera* leaf gel (Eshun and He 2004; Hamman 2008; Manvitha and Bidya 2014; Mahor and Ali 2016; Moghaddasi and Verma 2011; Periasamy et al. 2014; Qadir 2009).

Table 19.3 Plants and its main parts used for preparation of cosmetics and cosmeceuticals and its presumed active chemical constituents

Plant Scientific name	Main plant part's used	Active chemical constituent
<i>A. vera</i> L.	Gel from fresh leaves	Polysaccharides
<i>A. indica</i> , <i>A. Juss</i>	Fresh leaves and seed	Limonoids
<i>B. excelsa</i>	Fresh leaves	Glycosides, saponins
<i>C. guianensis</i>	Seeds	Limonoids, fatty acids
<i>C. nucifera</i> L	Fruits and seed	Phenolic compounds, vitamin E, terpenes, saponins
<i>C. guyanensis</i>	Trunk	Terpenes
<i>C. sativus</i> L.	Fruits	Water, antioxidants
<i>C. citratus</i>	Leaves	Essential oils
<i>E. prostata</i> L.	Leaves	Coumestans, glycosides, amyris
<i>E. oleracea</i> Mart	Fruits, seeds	Anthocyanins
<i>H. sabdariffa</i> L.	Fresh calyces	Anthocyanins, vitamin E, flavonoids
<i>L. aestuans</i> L.	Leaves	Essential oils
<i>L. nepetifolia</i> L.	Leaves	Flavonoids, terpenes, essential oils, coumarins
<i>M. maripa</i>	Seeds	Vitamins A and E, fatty acids
<i>M. citrifolia</i> L.	Fruits and seeds	Flavonoids, fatty acids
<i>M. olifeira</i>	Leaves	Ben oil
Orchid spp.	Seed	Essential oils
<i>P. boinicus</i>	Leaves	Essential oils
<i>S. alata</i> L.	Leaves	Phenolic compounds, essential oils
<i>T. indica</i> L.	Leaves and seeds	Polyphenols, flavonoids, xyloglucan, fatty acids

***Azadirachta indica* A. juss.**

In India, *A. indica* leaves, fruits, seeds, bark, and root extracts were used against different types of diseases in Ayurveda over two millennia such as diabetic mellitus, high blood pressure, fever, cold respiratory conditions, and cosmetics. Especially, oils extracted from seeds and fruits have been used for traditional medicine against redness, inflammation of the skin and acne. These results indicate that *A. indica* leaves extract contains nimbinin and Azadirachtin phytochemicals, which are useful for antimicrobial and antiparasitic activities. Neem oil contains oleic acid, palmitic acid, linoleic acid, and stearic acid phytochemicals. Hence, it could be used in synthesis of different cosmetics like nail polishes, toothpastes, shampoos, soaps, and balms (Djibril et al. 2015; Galeane et al. 2017; Hashmat et al. 2012; Mak-Mensah and Firepong 2011).

***Bertholletia excelsa* Humb. & Bonpl.**

B. excelsa is a native of Amazon forest, essential seeds of the Brazilian nut. These seeds are more abundant of vitamins, digestible minerals, staple diet, and dietary fiber. Brazilian nuts are commercially collected and mixed with different nuts. Oils extracted from these nuts consist of more than 75% of unsaturated fatty acids, mainly selenium, linoleic acid, oleic acid, phytosterols, polyphenolic acids, and vitamin E, particularly polyphenols and vitamin E show antioxidant properties. Hence, these phytochemicals could be used mainly in lotions, creams, shampoos, hair care products, aging skin, flaky skin, skin inflammation, and acne. Hence, the fatty acids are the applications of moisturizing effects (Chunhieng et al. 2004; Chunhieng et al. 2008; John and Shahidi 2010; Kluczkowski et al. 2015; Yang 2009).

***Bryophyllum pinnatum* (Lam) Oken.**

Since ancient times, mother-of-thousands *B. pinnatum* (Fig. 19.1) is especially used for the sores, boils, wounds, treat for burns, boils, as well as it has antiseptic, amphiphatic, antimicrobial, anti-inflammatory and conventional astringent properties. Leaves of *B. pinnatum* extracts consist of mainly fumaric acid and saponins (from various parts of plant), which is more essential for cosmetics and cosmeceuticals substances for skin regeneration formulas, hair growth syrups, facial creams, creams for wrinkles, treatment for acne, and anti-aging lotions (Afzal et al. 2012; Akpuaka and Ezem 2011; Amenta et al. 2000; Dey et al. 2012; El-Abdellaoui et al. 2010; Kaur et al. 2014; Nagaratna and Hegde 2015).

Fig. 19.1 The mother-of-thousands *Bryophyllum pinnatum* (Lam) Oken. (Crassulaceae)



***Carapa guianensis* Audl.**

The bark and seed oil extracts of *C. guianensis* are composed of alkaloids and terpenoids, respectively, which is used for antipyretic and antiallergic, antiparasitic, antimicrobial, anti-inflammatory and also having anti-wound healing medication purpose, respectively. Leaf and fruit extracts were traditional medicine for treatment of itching and intestinal worms. The crab or carap oil is composed of many fatty acids such as oleic acid, linolic acid, and palmitic acid which is used for preparation of skin and hair care products (Campos et al. 2007; Cabral et al. 2013; Henriques and Penido 2014; Letawe et al. 1998; Miranda Júnior et al. 2012; Nayak et al. 2010; Pereira et al. 2014).

***Cocos nucifera* L.**

Parts of *C. nucifera* plant are used for the traditional medicine, for example, in Brazil, Haiti, Papua New Guinea it used for treatment of arthritis from the husk fiber, root extracts are used to treat diarrhea, amenorrhea, and stomach pins, respectively. As per Indonesian and Fijan beliefs, coconut oil prevents hair loss. These are causes for the presence of tannins, phenols, flavonoids, triterpenes, steroids, saponins, alkaloids, and condensed tannins as well as fatty acids and vitamin E in different parts of plant. For these causes, coconut oil is base essential element for hair conditioners, shampoos, shower gel, sunscreens, moisturizers, body butters, nourishing, and emollients, skin infections, anti-aging, prevents dry skin and anti-redness (Da Fonseca et al. 2014; Esquenazi et al. 2002; Gopala et al. 2010; Holdsworth 1992; Lima et al. 2015; Sachs et al. 2002; Weniger et al. 1986).

***Copaifera guyanensis* Desf.**

Copaiba oils extracted from *C. guyanensis* (Fig. 19.2) tree trunk and bark have been many medicinal and cosmetic properties, were already known to American Indians. The trunk of *C. guyanensis* is used for injured animals to heal their wound and also it could be used for the treatment of skin diseases, to stimulate wound healing, infections, inflammations, and malignancies. Copaiba oils consist of biologically active chemical constituents such as diterpenens and sesquiterpenes, kaurenoic acid, copalic acid and caryophyllene. Because of these, they exhibit antibacterial, anti-eczema, anti-inflammatory, antibacterial, antifungal (especially *S. aureus*) and antioxidant properties. Hence, copaiba oils are significantly used in cosmetic industry in scars, stretch masks, shampoos, capillary lotions, soaps, bathing foams, and anti-acne (Da Silva et al. 2012; Leandro et al. 2012; Lucas et al. 2017; Veiga et al. 2007).

***Cucumis sativus* L.**

The plant of *C. sativus* is composed of more than 90% of water; also contains vitamin B, C, & K and β -carotene phenols and flavonoids phytochemicals. *C. sativus* fruits, fruit juices, fruit water, and fruit extracts are essential to be used in cosmetic formulation, the water considerably is essential benefit for the skin such as skin conditioning, eye and facial makeup, neck and face products, bath foams,

Fig. 19.2 Harvesting copaiba oil from the trunk of *Copaifera guyanensis* Desf. (Fabaceae)



soaps, skin hydrating products, cleaning products, detergents, facial peel products, skin rejuvenation products, body and hand lotions and hair care products (Akhtar et al. 2011; Ibrahim et al. 2010; Kumar et al. 2010; Mukherjee et al. 2013; Murad and Nyc 2016; Rajasree et al. 2016).

***Cymbopogon citrates* (Dc) stapf.**

The essential oils and phytochemicals are extracted from the leaves of *C. citates* (lemongrass), extensively used for the antimicrobial, antipyretics, diuretics, insect repellents, anti-inflammatory, antiprotozoals, antidyspeptics, spasmolytics, antibacterial, antifungal, antidiarrheal, antioxidants, antipyretics, cytoprotective. Oils are extracted from the leaves, phytochemical is composed of flavonoids, phenolic compounds, and essential oil is composed of citral, geraniol, citronella, citronellol, and myrcene. Essential oils are nice smelling, resulting in it could be used as fragrances, perfumes, creams, detergents, and creams. Preparation of ionones for cosmetics and perfumes citral is the main starting molecule. Essential oils are mainly used for the synthesis of skin care products, like creams, lotions, facial cleansers (Ekpenyong et al. 2014, 2015; Ganjewala 2009; Maheshwari et al. 2014; Mosquera et al. 2016; Olorunnisola et al. 2014; Pandey 2017; Shah et al. 2011).

***Eclipta prostrata* (L.) L.**

Extracts from different parts of *E. prostrata* are used for respiratory disorders, gastrointestinal complaints, fever, skin problems, microbial, parasitic infections, spleen enlargement, liver ailments, as well as hair greying and hair loss. Ethanoil and petroleum ether extracts of *E. prostrata* leaves are used for hair oils in Ayurveda and hair growth respectively. Extracts are composed of various phytochemicals such as oleanane type glycosides (eclalbasaponins) and triterpenes (oleanolic acid, ursolic acid, & amyryns). These compounds show potential antibacterial, anti-eczema, anti-inflammatory, and antioxidant properties. Hence, because of these reasons oils and extracts of *E. prostrata* are used for skin nourishing and skin anti-aging agents, as well as hair and hair growth (Baldi et al. 2011; Chan et al. 2014; Datta et al. 2009; Kaur and Chandola 2010; Kumar et al. 2005; Roy et al. 2008; Saraswat et al. 2015; Uddin et al. 2010).

***Euterpe oleracea* Mart.**

Various parts of *E. oleracea* extracts are used worldwide especially in Brazil processed into pulp, which is used for food products, juice in beverages, smoothies, and dietary supplements. Extracts of *E. oleracea* pulps are mainly composed of polyphenolic anthocyanin, palmitic acid, and oleic acids. Resultant extract shows potential antioxidant properties. Phytochemicals such as anthocyanins and phenolic compounds are significantly used for the anti-aging lotions, skin regenerating creams, treatment for skin damage, sunscreens, and anti-inflammatory products as well as fatty acids are used as cosmetics as hair conditioners, skin moisturizers, soaps, and shampoos (Bobbio et al. 2000; Daher et al. 2014; De Santana et al. 2017; Hogan et al. 2010; Kang et al. 2010; Portinho et al. 2012; Schauss et al. 2006; Yamaguchi et al. 2015).

***Hibiscus sabdariffa* L.**

H. sabdariffa L. (Fig. 19.3) is extracted from calyces used in traditional folk medicine system for a wide range of kidney disease, cough and bronchitis, gastrointestinal problems microbial infections and cosmetics. These applications indicate that the plant extracts contain vitamin E, flavonoids, phenolic substances as well as antioxidant anthocyanins, antibacterial and anti-inflammatory effects. Hence, *H. sabdariffa* L extracts are considerably used for preparations of hair and skin care products as well as flowers of *H. sabdariffa* L. crude polysaccharides acts as stimulatory effects (Abou et al. 2011; Brunold et al. 2004; Da-Costa-Rocha et al. 2014; Ismail et al. 2008; Liu et al. 2002; Mohamed et al. 2007; Mounissamy et al. 2002).

***Laportea aestuans* (L.) Chew.**

Extracts from *L. aestuans* are potentially used for traditional medicine system which includes eye infections, parasitic infections, and microbial as well as gonorrhoea and syphilis and also exhibit antioxidant and antimicrobial activity. Essential oils extracts from the leaves of *L. aestuans* are composed of methyl salicylate and



Fig. 19.3 The roselle *Hibiscus sabdariffa* L. (Malvaceae)

chrysenes -2-ol derivatives. Hence, essential oils are used for face masks, massage oils, lotions, creams, scrubs, facial tones, antidandruff shampoos and conditioners, lip balms as well as used for treatment for insect bites, chicken pox, acne, eczema, and blemishes (Chukwuma et al. 2015; Essiett et al. 2011; Lans 2007; Okereke et al. 2017; Oloyede 2016; Oloyede and Ayanbadejo 2014).

***Lenotis nepetifolia* (L.)**

L. nepetifolia (Fig. 19.4) plant parts (sepals, leaves, flowers, and roots) are used in traditional medicinal system. Hence, extracts are composed of active ingredients such as terpenes, terpenoids, quinines, alkaloids, Saponins, and coumarins as well as essential oils. Because of these active chemical constituents, they exhibit antibacterial, antioxidant, insecticidal, radical scavenging anti-inflammatory, and cosmetic properties. *L. nepetifolia* has been used for skin allergies, calm agitation, counteract muscle spasms, treatment for bronchial asthma, heal burns, pain, fever, cold, anti-malaria, and arthritis as well as it used for cosmetics such as skin regenerating agents, skin rashes, skin infections, and skin rejuvenating. Essential oils from this plant shown pleasant fragrance, it could be used for preparation of perfumes, because of the diterpenes and coumarins (Imran et al. 2012; Niteshwar and Kumari 2012; Oyedeji and Afolayan 2005; Oyedeji et al. 1999; Pedro et al. 1991; Udaya et al. 2013).

Fig. 19.4 The lion's ear
Leonotis nepetifolia (L) R. Br.
(Lamiaceae)



***Maximiliana marpia* (Correa) Drude.**

M. maripa edible oils are extracted from fruit, seeds, and pulp, composed of fatty acids, phytosterols, tocotrienols, glycolipids, tocopherols, and α -carotene. These chemical constituents exhibit antimicrobial, antioxidant, and moistening properties. For these reasons, *M. maripa* edible oils are used traditionally in skin ageing, skin care products, smoothen scared skin, massage oil, moisturizers, rejuvenation, soaps, shampoos, treating acne, and hair conditioners (Balslev et al. 2008; Bereau et al. 2001; Dos Santos et al. 2015a, b; Dos Santos et al. 2015a, b; Fernández et al. 2016; Pereira et al. 2013).

***Morinda citrifolia* L.**

The extracts from *M. citrifolia* are potentially used for the treatment of wounds, sprains, sores and diabetic mellitus, AIDS, high blood pressure, malignant neoplasm's and also used in skin injury, infection by ultraviolet radiation, and seed oil is used as anti-inflammatory for acne. Hence, these extracts are used in preparation of skin and hair care cosmetics and cosmeceuticals like shampoos and conditioners, body and foot lotions, deodorants, ointments, hand and facial soaps, eye creams, face masks, moisturizers, day and night creams as well as for treatment for acne.

(Assi et al. 2017; Kakad et al. 2015; Krishnaiah et al. 2012; Levand and Larson 1979; Palu et al. 2012; Potterat and Hamburger 2007; West and Sabin 2012).

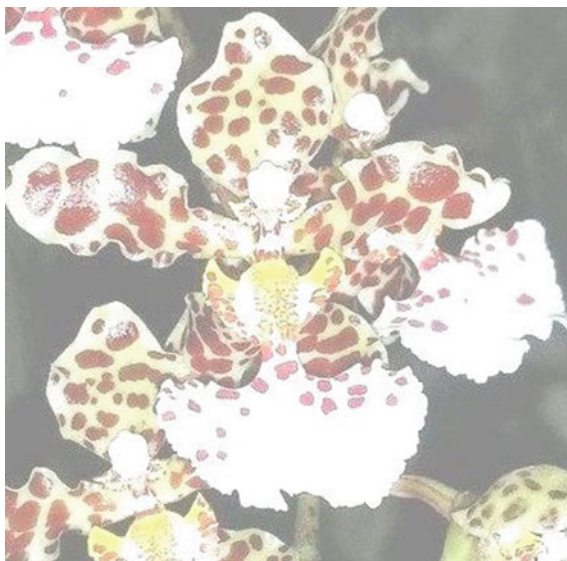
***Moringa oleifera* Lam.**

M. oleifera leaf and seed oils are used in traditional medicinal system, *M. oleifera* seed oil is known as ben oil, ben oil is composed of fatty acids mainly behenic acid. Because of this active substance, it could be used for moisturizers, massage oils, and aromatherapy. Leaf extracts of *M. oleifera* are composed of significant amount of vitamins A, C, & E, polyphenols and β -carotene which might own antioxidant and anti-inflammatory properties. Hence, for these active ingredients of leaf and seed oil extracts might be used in sunscreens, scrubs, body oils, creams, lotions, balms, hair care products, moisturizers as well as seed oils are used in preparation of perfumes. *M. olifeira* extracts relieve spasms, cardiac stimulant, diabetes mellitus, cardiac stimulant, antimicrobial, antiparasitic, and other conditions could be used (Ali et al. 2013; Ashraf and Gilani 2007; Kale and Megha 2011; Ogbunugafor et al. 2011; Ojiako and Okeke 2013; Taher et al. 2017; Warra 2012; Warra 2014).

Orchidaceae.

Generally, Orchidaceae (Fig. 19.5) plants and its parts show potentially various traditional medicinal systems. Especially these family plants are used in Chinese traditional medicine for treatment of cancer, diabetes mellitus, hypertension, and urinary tract infections. For example, in this family, *V. planifolia* is used for the preparation of perfumes, deodorants, and aromatherapy products. Some of these family plant extracts are used in cosmetics and cosmeceuticals. Some of them are composed of flavonoids and phenolic compound, exhibit anti-inflammatory,

Fig. 19.5 The tiger orchid
Oncidium jonesianum
(Orchidaceae)



anti-aging, and antioxidant property. Some plants from this family are water bound or hydrophilic chemical constituents. These constituents increase corneum hydration and have been used for skin moisturizers and emollients. Flowers of this family are the source of perfumes, fragrances, skin care products, hair care products, and bathing products, as well as flower bouquets, are useful to identity scent and perfumes (Bulpitt et al. 2007; Hadi et al. 2015; Hossain 2011; Menon and Nayeem 2013; Minh et al. 2016; Paul et al. 2013; Ribeiro et al. 2015; Sadler et al. 2011).

***Plectranthus amboinicus* Lour.**

Extracts from *P. amboinicus* have been used for the treatment of fever, infections, and genitourinary disorders, gastrointestinal and respiratory diseases. Essential oils extracted from this species are used for scent as well as in the treatment of skin diseases like wounds, burns, sores, and also used for insect bites, allergies, antiseptic dressing for wounds and parasitic infections. Plant extracts are composed of phenolic compounds, monoterpenes, sesquiterpenes, and diterpenes. These active constituents show significant antioxidant, anti-inflammatory, and antimicrobial properties. These properties indicate that essential oils could be used in soaps, skin cleansers, anti-wrinkle, anti-ageing, day and night creams, ointments, skin itchy, moisturizers and skin rejuvenating (Bhatt and Negi 2012; Chifundera 2001; Erny et al. 2014; Harsha et al. 2003; Lukhoba et al. 2006; Rabe and Van Staden 1998; Roshan et al. 2010).

***Senna alata* (L.) Roxb.**

S. alata L. (Fig. 19.6) extracts of natural products and essential oils from various parts such as roots, bark, fruits, seeds, and leaves are composed of bioactive substances such as phenolic substances, alkaloids, terpenes, anthraquinones, tannins, and phytosterols. Few of these chemical constituents exhibit laxative and purgative properties. Essential oils are used for treatment of ringworms infections, fungal infections, as well as scabies. Bioactive chemical substances from this plant show antifungal, antioxidant, and anti-inflammatory activity. Essential oils reduce skin damage from ultraviolet irradiation. Hence, *S. alata* leaf extracts are considered as cosmetics. Leaf extracts are used in skin care products like skin-repairing agents, anti-ageing, sunscreens, and soaps (Adelowo and Oladeji 2017; Ehiowemwenguan et al. 2014; Meenupriya et al. 2014; Moriyama et al. 2003; Oladeji et al. 2016; Oresajo et al. 2010; Sule et al. 2011).

***Tamarindus Indica* L.**

Preparation of *T. indica* extracts is composed of flavonoids, polyphenols, and linoleic acid and oleic acid. These phytochemicals exhibit antioxidant, antibacterial, antifungal, antiviral, antiparasitic, and anti-inflammatory properties. Hence, plant extracts could be used in traditional medicinal system like malaria, fever, parasitic infections, and respiratory problems. Flavonoids and polyphenols are present in *T. indica* leaves extract, so it exhibits wound healing properties and hemicelluloses

Fig. 19.6 The candle bush
Senna alata (L.) Roxb.
(Fabaceae)



xyloglucan substances extracted from seeds of *T. indica* used for skin damage from UV radiation. Hence, extracts from *T. indica* are used for preparation of skin care products such as moisturizers, face masks, skin rashes, anti-aging night creams, ointments, sunscreens, soaps, body lotions facemasks, facial toners and lip balms (Al-Fatimi et al. 2007; Attah et al. 2015; Escalona-Arranz et al. 2010; Havinga et al. 2010; Kuru 2014; Luzia and Jorge 2011; Mesfin et al. 2012; Naik et al. 2017; Strickland et al. 2004).

***Tripogandra serrulata* (vahl) Handlos.**

T. serrulata extracts are prepared from various parts of the plant; it is native of Caribbean and Southern American countries. These extracts are traditional medicine used for kidney disorders, uterus cleaning, treating traumas, wounds, and oviducts. Moreover, leaves are used to treat hair growth and hair loss treatment. For these reasons, plant extracts are used for the preparation of hair care products. Despite, the shortage of comprehensive data on the phytochemical information about the plant extracts (Caballero-George and Gupta 2011; De Filippis et al. 2017; Funasaki et al. 2016; May 1982; Pereira and Bartolo 2016; Valadeau et al. 2010; Sedoc 1992; Venugopalan et al. 2011).

19.7 Applications of Natural Products in Cosmetics

Some of the natural products from the plants have been used for skin and hair problems. For instance, different parts of these plants *Rubia cordifolia*, Linn. *Callicarpa macrophylla* Vahl, *Acacia concinna* DC, *emblica officinalis* Gaertn, and *Curcuma longa* have been used directly for face and hair problems. Ethnic and community group's historically natural products have been used for the treatment of different hair conditions and skin diseases. Natural products intimate potential properties like antioxidants, antimicrobial, anti-inflammatory, antimelanogenesis, antihyaluronidase, and antityrosinase in cosmetics. Some of natural products have been used in different applications shown below.

19.7.1 Natural Products as Skin Care Agents

Dry skin treatment.

Stratum corneum binding of water indissoluble could be compromised and ineffective. For this reason, it is beneficial to decrease the transepidermal water loss by applying occlusive films. Hence, there is no cause why mineral oil or petrolatum should not be used. Hence, vegetable oils have more benefits for dry skin treatment.

Castor oil formed from (*Ricinus communis*) castor seeds, consists of more than 50% of fixed oil, more viscous, pure when colorless and has slight odor. Castor oil is composed of ricinoleic acid and unsaturated fatty acids. Hence, castor oil is used to skin smoothing, protect skin from harsh climate as well as used to prepare soaps. Ricinolic acid and its analogs are used to improve the skin moistening and smoothing qualities as well as enhance the skin conditions such as acne and rough skin. Hydrogenated castor oil or its esters oils has been used for solubilizers for toiletry as well as skin and hair care cosmetic formulations and are useful condition and cleaning of the skin and hair (Sato 2002). Cocoa butter is used for the smoothing of sunburn and windburn. Cocoa butter is obtained from *T. cacao*. Cocoa butter composed of triglycerides consists of palmitic acid, stearic acid, and oleic acid as well as monounsaturated fatty acid. Hence, it is widely used in moisturizer and also used in cosmetic preparations and it has reported as potential antioxidant (Sato 2002). Sunflower oil is composed of polyunsaturated fats, triglycerides, or linoleic acid as well as essential fatty acids. These constituents are used for maintaining good skin. Linoleic acid reduces the water loss transepidermal and eliminates the scaly lesions normally with patients. Hydrated sunflower oil and oleic acid contents are used in natural and functional raw materials in cosmetic preparations. Olive oil is composed of triglycerides, tocopherols, squalene, carotenoids, sterols, chlorophylla, polyphenols, squalene, volatile oils, flavored compounds, and fatty acids. These constituents are useful for treatment of dry skin, as well as used in lip balm, soap, hand lotions, shampoos and conditioners and

massage oils. Extracts of leaves and fruits of olive tree show anti-inflammatory and oxygen scavenging effects (Tehara and Hachimaki 2002). Olive oil shows potential free radical scavenging effects, due to rich in polyphenols; it is applied for contact dermatitis, skin damage, atopic dermatitis, eczema, xerosis, seborrhea, psoriasis, rosacea thermal and radiation burns as well as other skin aging and inflammations.

Eczema.

Eczema is a skin condition specified by scaling, itching, redness, and swelling. For treating eczema, turmeric has been used potentially. *C. longa* L; turmeric is processed rhizome portion, which is used for traditional medicine. It is usually boiled yellow powder. Curcumin is a major chemical component in turmeric, which has potential biological activities such as anti-HIV, antiparasitic, antibacterial, anti-carcinogenic, antioxidant, anti-inflammatory as well as wound healing powder, applied to septic and aseptic wounds and inhibition of lipid peroxidation. Curcumin is also used to check and prevention or treatment for psoriasis, skin damage from sun radiation, wounds, burns, acne, and premature aging (Phan et al. 2001).

Acne, spots, and pimples.

Skin condition damage causes whiteheads, blackheads, inflammation, sweat glands, and hair follicles. Some natural product extracts are traditionally used for the treatment of acne, spots, and pimples. Extracts from *A. vulgaris*, *A. absinthum*, and *A. campestris* are used for rapid healing wounds, skin ulcers as well as eczema, herpes, and purulent scabies (Aniya et al. 2000). Extracts from *O. gratissimum* and *O. basilicum* essential oils are used for treatment of acne, pimples and spots as well as it shows antibacterial treatment for acne, antiseptic and antimicrobial activities (Orafidiya et al. 2002). *P. sativum* extracts are used for the treatment of acne, due to peas composed of fats, salts, proteins, lecithins, and carbohydrates. For example, crushed peas are used for face masks, acne, and wrinkled skin (Orafidiya et al. 2002). *C. pepo* (pumpkin) extracts are composed of fatty acids; it has been used for traditional medicine, and it shows potential anti-inflammatory properties due to fatty acids are mainly composed of palmitic, stearic, and oleic acid. The roots, leaves, and seeds of these extracts are used for pimples, blackheads, sores, and herpes lesion (Orafidiya et al. 2002). *A. cepa* (red onion) has been used for traditional medicinal system, it could be used externally for boils, blackheads, and abscesses to draw out of the infection as well as reduce the inflammation and improve the healing. Red onions are composed of high amount of flavonoids; hence, it shows potential anti-inflammatory and antiallergic properties as well as onion juice shows antimicrobial and antifungal effects. In Africa, onion juice is applied for scalds, infection, and burns, especially in East Africa onion skin has been used for body sores and facial (Aburjai and Natsheh 2003).

Anti-aging skin treatment.

Human Skin aging caused by UV radiation from the sun is one major environmental factor. Skin aging is due to exceeded degenerative and regenerative changes and epidermises are analyzed by wrinkling and thinning together in the aspect of

Table 19.4 Plants used in skin cosmetics and toiletries as cosmeceuticals

Plant Scientific name	Active chemical constituent	Cosmetic use
<i>A. Catechu</i>	Catechin	Antioxidant
<i>A. Vera</i>	Aloin	Antidermatitis
<i>A. Recutita</i>	Chammomile	Antiphlogistic
<i>A. Sativum</i>	Alliin and Allicin	Antioxidant
<i>B. Seeds</i>	Rutin	Anti-wrinkle
<i>C. Sativus</i>	Crocetin	Protective
<i>C. Longa</i>	Curcumin	Antibacterial
<i>C. Asiatica</i>	Centella	Skin Firming/Conditioning
<i>C. Limonus</i>	Hesperedin	Fungal Infection of Skin
<i>G. Glabra</i>	Glycyrrhizin	Skin Whitner
<i>G. Tea</i>	Chammomile	Photoprotective
<i>C. Murula</i>	Lupenol	Anti-aging
<i>R. Officinalis</i>	Rosemary	Anti-aging
<i>E. Officinale</i>	Ascorbic Acid, Tannins	Protective
<i>G. Biloba</i>	Ginki	Skin Tonic
<i>P. Corlifolia</i>	Psorolin	Skin Staining & Pigmenting Agen
<i>T. Viridis</i>	Gallic Acid, Catechin and Rutin	Antioxidant
<i>V. Vinifera</i>	Carotene	Eczema
<i>D. Carota</i>	Beta Corotene	UV Protection
<i>L. Esculantum</i>	Tamotine and Tamotidine	Potent Bacteriostatic
<i>H. Virginiana</i>	Gallic Acid	Cooling Agent

lines, groove, crack, and wrinkle, especially in lines of facial expressions. This is the reason for rapidly evident morphological alterations. There are many so-called anti-aging that is traditionally applied material nothing more than moisturizers. Ginseng (*P. ginseng*) is a traditional medicinal system for treatment of anti-ageing, for more than 2000 years in Korea. Compared to other countries, Korean Ginseng is chemically and physically different. Extract of this plant is more active to enhance the skin metabolism, provide soften and moisture as well as enhance the skin whiteness and reduce keratinization. The anti-aging effect leads due to the increase of blood circulation and increase of skin nutrition and cell proliferation (Aburjai and Natsheh 2003). Moreover, natural extracts or oils are a major source of phytosterols, and tocopherol chemical constituents, which has been used for antioxidant and bioactivity skin formulations. Generally, wheat germ oil, corn oil, and seaweed extracts help to maintain skin elasticity and moisture. The details of plants and their benefits in cosmetic benefits are shown in (Table 19.4).

Free-radical scavenging effects.

Natural product extracts are major source of plants, hence plant extracts shows potential free-radical activity, due to polyphenols its derivatives, tannins, and

flavonoids (Ashawat et al. 2000; Pietta 2000). *C. sinensis* yields Black and Green Tea. Black and green tea acquire leaves fermentation and after harvest leaves are immediately steamed and dried, respectively. Tea is composed of more than 500 chemical constituents such as amino acids, tannins, flavonoids, vitamins, caffeine and polysaccharides, which are similarly found in lemons. Black and Green tea contain almost same amount of vitamin B6, vitamin E, and vitamin K, but 90% of vitamin C destroyed during the fermentation process. Flavonoids which is present in tea proven potential properties such as antibacterial, antiviral, antioxidant, anti-inflammatory, antiallergic and while tannins show antiseptic and antioxidant properties. Root extracts from tea are composed of Saponins; it shows potential anti-inflammatory and antioxidant properties. Green tea consists of polyphenols which are major active constituents; catechins are major important polyphenols, while flavonoids such as phenolic acids and flavones. Recent days Green tea is now subjected key attention, it is proven as potential antioxidant property for its capability to repair UV photo-damage and phototoxicity. Green tea and its extracts are used for dry skin treatment and thus it shows potential anti-inflammatory and anticarcinogenic effects of skin disorders (Katiyar and Elmets 2001). While composition of polyphenols is less abundance in black tea when compared with green tea; but, it is still considered as a good source of antioxidant properties. Applying black and green tea oral extracts decrease the photochemical damages to the skin (Katiyar and Elmets 2001). Green and black tea extracts are remaining essential in preventing the early sign of UV radiation phototoxic effects (Katiyar and Elmets 2001). *V. vinifera* L. (grape seed) is composed of different types of polyphenolic proanthocyanidins. These polyphenols show potential antioxidant activity when compared with Vitamin C and Vitamin E and it shows tyrosinase-inhibiting activity, which has shown potential skin-lightening and anti-aging cosmetics (Lee et al. 2001).

Anti-inflammatory effects.

In many diseases, inflammation is usual response. It's bearing and controlling in the treatment of these pathologies. There are many natural products that show anti-inflammatory properties. *T. pretense* L. (Red clover) shows potential anti-inflammation for multiple skin conditions like acne, rash, psoriasis, and eczema. Red clover consists of isoflavones, which is used for UV radiation protection, reduces the inflammatory aedema reaction hypersensitivity induces simulated UV radiation. *M. recutia* L. (German chamomile) and *A. nobilis* Linn. (Roman chamomile) extracts similar chemical constitutes with almost same ratio. Extracts from these plants traditionally are used in the form lotions, ointments, and inhalations. Essential oil extracts and its isolated substances from these plants are used for treatment and prevention of different skin disorders. Chamomile essential oil extracts consist of flavonoids like apigenin and glycosides, which shows potential antipruritic, anti-inflammatory, and antierythema effect (Aburjai and Natsheh 2003). Extracts from chamomile consist of chamazulene and bisabolol shows anti-inflammatory activity. *T. foenum* (Fenugreek) is fragrant herb, whose seed is used for traditional medicinal system for all ages. Europe, Greek, Romans,

Egyptians, and among others are used for medicinal and delicious purpose. Seeds of this extract show potential antioxidant and anti-inflammation and emollient properties. Extracts are traditionally used for treatment of skin inflammations, mouth ulcers, and chapped lips. Worldwide *G. glabra* L. (Licorice root) extracts used in traditional medicinal system. Root extracts of these plants composed of 5–10% of glycyrrhizin, a sweet taste and in general, it is less soluble in blood compared with Saponins. Hence, Licorice root extracts consist of glycyrrhetic acid, which shows potential anti-inflammatory effects as well as used for skin problems like irritations and acne (Aburjai and Natsheh 2003).

Miscellaneous.

Cucumber (*C. sativa* Linn.) is palliative, which cools and heals the irritated skin by sun radiation or cutaneous eruption. Cucumber and lemon extracts are used in cosmetics and cosmeceuticals products that are used for the treatment of hyperpigmentation. Both extracts are not interfering with each other and provide skin lighting. Many scientific reports indicate the presence of antioxidant enzymes and superoxide's activity with cucumber fruit and highest in the skin (Aburjai and Natsheh 2003).

Enumeration.

E. officinalis Gaertn; commonly known as Amla, dry fruits of this plant are used for traditional medicinal system and cosmetics. Fruit extracts are composed of phyllembic acid as well as isolated other chemical constituents such as ellagic acid, corilagin, terchebin, trigalloylglucose from fruits. These extracts are used for treatment of cooling, diuretic, laxative, and it is rich source of vitamin C. Vitamin C is five times rich when compared with orange juice; for this reason, it is used for hair dyes. The fruit powder and extracts are used as hair care products such as shampoos and used as medicine for hair roots. *Rubia coedifolia* Linn. its common name Manjit, from this plant dry roots and stems are used for traditional medicine, especially used in cosmetics. Roots and stem extracts are composed of purpurin, munjistin, Alzarin, and glucosides as well as anthraquinone derivatives. These chemical constituents are used for antiseptic, antidiysenteric deobstruent and root ionic. Decoctions of leaves and stems extracts are used for vermifuge. Especially extracts from stem are used for rhinosinal infections due to the presence of septilin drug as well as roots extracts are used as coloring medicinal oils. Extract could be applied directly in skins care such as removal of dark spots on the face, treatment for acne, skin regeneration, and anti-ageing.

Acacia concinna DC. Is commonly known as Ritha and Shikakai in India. The extracts from this plant are used especially as hair care products; treatment for hair growth, hair splitting, dandruff, and hair fall. It is used to keep original hair color. These applications due to plant extracts are composed of saponin, mixture of acacinin-A and B as well as carbohydrates are composed of fructose, glucose, and xylose. Sometimes seed extracts could be used for fish poison.

According to the ethnic or community groups understanding, the above-mentioned plants are successfully used for skin and face problems such as

dark shadows, wrinkles on the face, acne, and pimples. Skikakai and amla could be used for the hair problems such as hair color, scalp care, hair falling, and dandruff. Particularly, Indians used cosmetics and cosmedicals for skin and hair care as shown in (Table 19.5). Besides some other medicinal plants having soap properties which can be used for skin and hair care products are shown in (Table 19.6) (Sharma et al. 2003).

19.7.2 Natural Products as Hair Care Agents

Natural products are used for stimulating hair growth, hair color, and dyes as well as scalp problems like dandruff.

Hair growth stimulants.

Nowadays, natural products and its derivatives are used for hair growth and hair tonic products and precaution of alopecia, due to increasing blood circulation,

Table 19.5 Plants used for cosmetics for skin and hair care

Plant Scientific name	Family	Part used	Cosmetic use
<i>A. concinna</i> DC	Mimosaceae	Pods	Soaps, hair splitting, hair falling, and dandruff
<i>A. barbadensis</i>	Liliaceae	Leaves	Hair falling, dandruff, and sun burn
<i>A. racemous</i>	Liliaceae	Roots	Used in cure of wrinkle on face
<i>A. indica</i>	Meliaceae	whole plant	Skin, hair, and scalp care
<i>B. orellana</i>	Bixaceae	Seed pulp	Seeds used for color, mascaras, & lipcare
<i>C. macrophyllaia</i>	Verbenaceae	Fruits	The fruits are blended in creams to treat acne
<i>C. longa</i>	Zingiberaceae	Rhizome	Improves the color of the skin
<i>C. amada</i>	Zingiberaceae	Rhizome	A good face pack
<i>E. prostrate</i>	Asteraceae	Whole plant	Used in keep the hairs in original color
<i>E. officinalis</i>	Euphorbiaceae	Fruits	Commonly used in hair care
<i>A. moschatus</i>	Malvaceae	Seeds	Used to provide musk like fragrance to cosmetics
<i>H. abelmoschus</i>	Malvaceae	Seeds	Used to provide musk like fragrance to cosmetics
<i>L. inermis</i>	Lythraceae	Leaves	Used to color for hairs
<i>O. dillenii</i>	Cactaceae	Fruits	Used in lipcare
<i>R. cardifolia</i>	Rubiaceae	Whole plant	Application on skin and lip care and treat for acne and pimples

Table 19.6 Selected plants in India used in soaps as cosmetics

Plant Scientific name	Family	Common name
<i>A. concinna</i> DC	Mimosaceae	Shikakai
<i>A. millefolium</i> Linn	Asteraceae	Gandana
<i>A. nobilis</i> Linn	Asteraceae	Roman Chamomile
<i>L. inermis</i> Linn	Lythraceae	Henna
<i>M. chamomilla</i> Linn	Asteraceae	Babuna
<i>M. fragrans</i> Houtt	Myristicaceae	Jayaphal
<i>N. jatamansi</i> DC	Valerianaceae	Jatamansi
<i>P. emblica</i> Linn	Euphorbiaceae	Amla
<i>S. mukorossi</i> Gaertn	Sapindaceae	Reetha (soap nut)
<i>S. saponaria</i> Lour	Sapindaceae	Reetha (soap nut)
<i>S. trifoliatius</i> Linn	Sapindaceae	Reetha (soap nut)
<i>V. officianalis</i> Linn	Valerianaceae	Tagger

activation of dermal papilla, increased nutrition through increased blood flow and antitestosterone action is not yet clear (Mans and Grant 2017). Grape seeds and *G. biloba* leaf extracts are composed of proanthocyanidins. This has promoted proliferation of apoptosis hair follicle cells. Thus, these extracts are suggesting potential hair tonic (Aburjai and Natsheh 2003). But other plants claimed potential hair growth such as aloe, henna, rosemary, and sage. But it required further clinical trials to use traditional medicine. *A. barbadensis* and *A. vera* gels are used traditionally for hair growth (alopecia) and hair loss. The plant extracts consists of aloenin that is a major chemical constituent, which has major responsible for hair growth without any skin irritation and side effects (Aburjai and Natsheh 2003). Henna (*L. alba* L.) has been used for hair dyes. Since ancient time, Egyptians are used to hair loss. More than 500 species of sage is used for traditional medicine as general medicine. Generally, it is used for healing purpose. *S. officinalis* L. is also known as garden sage. The extracts of these sages are used as lotions to improve the skin and hair growth as well as conditioner. Combination of sage and rosemary used to maintain the dark wavy hair and stimulate hair growth. *S. officinalis* L active chemical constituents such as tannins, Saponins as well as camphor and borneol are accountable for the effect on hair (Aburjai and Natsheh 2003). Rosemary (*R. officinalis* Linn), is a known aromatic traditional medicinal plant. It is used in folk medicine to stimulate hair growth. It is delicious, medicinal, and cosmetic properties. Rosemary consists of coffeic acid and its derivatives like rosmarinic acid which shows potential antioxidant property.

Dandruff treatment.

In the recent years, dandruff became a major problem due to fungal infections, microbial, and environmental conditions. The dandruff has been knowledgeable, because of scaling and flaking of the scalp. Dandruff sufferers get damaged scalp as

well as decreased lipid level, ceramides, cholesterol and fatty acids. Hence, epidermal water level reduces on the scalp which causes dandruff (Harding et al. 2002). Rosemary and sage extracts are potentially used for dandruff. The extracts are used for the treatment of greasy hair; hair loss, and skin as well as extract sage massaged on the scalp could control dandruff, loss of hair, or hair falling. Thyme essential oils also used to inhibit the dandruff, scalp rub to avert hair loss as well as rosemary and thyme encourage hair health. Garlic extracts are used traditional medicine for dandruff and as a vegetable, it includes potential medicinal properties such as antifungal, antibacterial, antioxidant, antiseptic, tonic, and anti-inflammatory (Agiga and Seki 2000). Garlic could not be used directly; it causes burning sensation, contact dermatitis, and allergic reactions for some people. Walnut leaves extracts are used in external applications for hair loss, itching, eczema, acne, peeling, and dandruff as well as skin disorder treatment such as itching, emollient, abrasions, frostbite, treatment for sun burns, and nappy rashes as well as dandruff and scalp problems (Aburjai and Natsheh 2003).

Hair coloring.

For hair coloring, vegetable oils are usually recommended, because of low allergenic power. For hair color, natural products do not have great advance, since plant extract dyes or natural dyes are unstable in solution form, liable to oxidation, pH color shift, fading and discoloration and single dye may not give right color for hair. But only walnut and henna are suitable for hair color by mixing of leaves of other plants (Aburjai and Natsheh 2003). *L. inermis* is known as henna. It is used for hair color, feet, and hand color as well as used for certain skin disorders. Henna consists of lawsone chemical constituent, which is responsible for developing red color in henna. The chemical constituent is isolated from leaves as brown powder. Lawsone has strong binding capacity to the hair, due to the chemical reaction between thiol groups with keratin. German chamomile leaves extracts consist of apigenin flavonoids, which could be used for dull golden yellow color as well as flowers extracts are used for hair rinse. Turmeric also is used for hair color to convert yellow to deep orange color which is due to Curcumin pigment present, which is responsible for yellow color of herb. *H. sabdariffa* L. extracts show red color due to extracts composed of red color anthocyanidins such as delphinidin could be used. But red color depends on pH of the solution.

19.7.3 Essential Oils Used as Cosmetics

Essential oils are the complex and composition of mixtures. Aromatic and medicinal plants and its oils have been used in perfumes, cosmetics, medicines, and culinary applications. Essential oils could be used for bath and skin massage, as scent (inhaled directly or diffused). Since ancient time, essential oils are used for pain relief, tension alleviation, skin care, fatigue, produce sense of relaxation and revitalize the entire body which is potential benefit for cosmetics. Essential oils and

Table 19.7 Plant essential oils are used in cosmetics

Plant	Family	Essential oils extracted from parts
<i>A. squarrosus</i> L.	Gramineae	Roots
<i>V. zizanioides</i> L.	Gramineae	Roots
<i>C. aurantiacum</i> L.	Rutaceae	Flowers
<i>E. dives</i> Schauert	Myrtaceae	Leaves
<i>J. officinale</i> Linn	Oleaceae	Flowers
<i>J. virginiana</i> Linn	Pinaceae	Wood
<i>M. piperita</i> Linn	Labiataeae	Aerial parts
<i>M. champaca</i> Linn	Magnoliaceae	Flowers
<i>M. elenhi</i> Linn	Sapotaceae	Flowers
<i>P. fascicularis</i> Lamk. Syn	Pandanaceae	Male inflorescence
<i>R. damascene</i> Mill	Rosaceae	Flowers
<i>S. album</i> Linn	Santalaceae	Wood
<i>S. lappa</i> Clarke	Compositae	Roots
<i>S. robusta</i> Roth	Dipterocarpaceae	Stem
<i>S. aromaticum</i> Linn	Myrtaceae	Flower bud
<i>V. odorata</i> Linn	Violaceae	Flowers

its derivatives are used for skin emollient, hair conditioners, pleasant aroma, and skin elasticity. Essential oils are composed of terpenoids, phenylpropanoids, and fatty acids. Terpenoids belong to mainly mono, di, and sesquiterpenes. These largest terpenoids more than 30,000 groups are synthesized by isopentenyl diphosphate and other chemical constituents are present such as small chain alcohols and aldehydes, it is formed by conversion of fatty acids and phospholipids. Essential oils show different medicinal and cosmetic properties (Reddy 2019) as well as some essential oils producing plants are used in cosmetics shown (Table 19.7).

Cosmetic benefits.

Essential oils could be used in perfumes, skin lotions, hair care products and pleasant smell and glow. Essential oils show potential antibacterial activity, hence it could be used in preservative system in cosmetics. The essential oil efficiency depends on both concentration as well as the microbial strain. Essential oils could be used in cosmetics, for instance, menthol, mint, camphor, and eucalyptus oils as cooling agents, as well as menthol analogs such as methoxypropanediol, menthyl hydroxybutyrate, menthyl glucoside, menthoxy furan, and menthy lactate as a refreshing the skin (Aburjai and Natsheh 2003).

Perfumery.

Perfume word is derived from Latin. Essential oils are major applications for the perfumes. In ancient times, perfumes are obtained by simple method to produce perfume, soak flower petals in fat known as pomade (Barel et al. 2001). Plant flower fragrance has rapidly converted volatile constituents into high impact commercial

commodity. Cosmetics, perfumes, and therapeutic fragrances are extracted from flowers of some aroma plants such as narcissus, tuberose, gardenia, and rose. Perfumes are mainly used in two purposes, one it could be used as cosmetics and toiletries precuts such as hair products, personal care products, bath products, deodorants, and fine fragrance and other types used as household products include laundry products, surface cleaners, room fresheners, washing liquids, and disinfections. Essential oils are major ingredients for preparation of perfumes. Essential oils are composed of hundreds of suitable ingredients, which are added to fragrance composition to improve the smell. Still successful fragrances contain significant quantities of naturally occurring essential oils (Barel et al. 2001).

Hair care.

Essential oils are used for hair care products to remove negative smell from perm lotion; it helps for hair conditioning and shampoos, improvement of hair texture and also longer lasting pleasant smell. Rosemary and chamomile essential oils are added straight to mild shampoo. Rosemary oil can help hair condition and potential hair growth as well as tea tree could help controlling dandruff. Lavender could be used to repel lice and fleas. Essential oils mixed with hair care products; it would be improved shine and conditioning effects.

Aromatic skin care.

Skin problems are generally the surface manifestation of deeper conditions such as environmental pollution, toxins from blood, hormonal imbalance, nervous and emotional difficulties. Essential oils are potential use for such problems. Essential oils are soluble in oils and alcohols and important scent to water. Hence, essential oils provide ideal chemical constituents for cosmetics and specific disease. Essential oils are made up of very small molecules, and interact through the skin, it means of lipophilic fractions reacting with the lipid parts of the cell membrane. For instance, citrus oils such as lemons, grapefruits, oranges, and tangerines are composed of mixture of alcohol, acids, esters, carbohydrates, ketones, and aldehydes. These chemical constituents are rich in fragrance and flavor. Hence, essential oils are used to important taste to different products, aroma, and taste. Essential oils are used personal perfumes widely, where they are used pure and frequently combined with synthetic substances. Lavender oils distilled from mainly *Lavandula* have been used therapeutically and cosmetic agents. These oils are extremely used for the preparation of soaps, perfumes, and skin lotions. Lavender oils show potential antibacterial, antioxidant, antifungal properties. Essential oils from black cumin are composed of thymoquinone, carvacrol, 4-terpineol, and t-anethole shows antioxidant, antibacterial, antifungal and anticarcinogenic, analgesic and anti-inflammatory properties. Hence, these oils could be used for skin care (Aburjai and Natsheh 2003).

19.8 New Trends in Cosmetics (Plant Origin of By-Products)

In recent days, fruits, vegetables, and foods (agronomical) industries increase the amount of waste, which produce different types of expendable by-products; rich in valuable components such as pharmaceuticals, food, and cosmetics. There are many cosmetic active constituents which are extracted from meat, fish, and dairy products. Furthermore, in agronomical disposable wastes are used in cosmetic field. Hence, these products are commercially less expensive, bio-feasible, more effective, and environmental friendly. In consequences to plant-derived extracts from wastes are adopted in cosmetic industry. Moreover, the generated wastes or products from organic farming are absolutely more valuable source and safe to use in cosmetics. Since decades, fruits and vegetables and agricultural products are considerable more significant in our everyday diet and their indubitable nutritional values have been comprehensively studied (Barbulova et al. 2014). Since decades, human kinds used fruits and vegetables for fragrance, perfumes, flavoring, preservatives, cosmetics, and pharmaceuticals. Vegetables, fruits, dairy, and agricultural products have enormous health benefits such as heart diseases, heart stokes, respiratory disorders as well as variety of cancers. Fruits and vegetables are composed of flavonoids exhibit that shows potential antioxidant activity; grapes and apples present active substances such as flavonoids, catechins, epicatechins, and procyanidins, which are used for heart diseases; some vegetables such as red tomatoes and orange are composed of carotenoids, β -carotenes is present, which are effective for neutralizing the free radicals; in cherries, red grapes, and berries anthocyanidins are present, which are used for brain function; citrus fruits are more dominant for flavonoids. Because of the above reasons, fruits and vegetable consumptions considerably increased in last few decades and also the amount of wastes and residues increased substantially. Without observing waste during food processing, every year, agro-food industries generate 800,000 tons wastes around worldwide (Ayala-Zavala et al. 2010; Tuck et al. 2012).

Food and agriculture industries are generating 10–60% (Table 19.8) of solid waste and raw materials. It was demonstrated that in few cases main products are less valuable than waste products (Liu et al. 2012). It was indicated in percentages, which is preferred to call by-products. Industry by-products are capable to be recycled as valuable products. These by-products are potentially made by fruits, skin, stems, seeds, leaves unusable pulp, and wastewaters generally through way. In few cases, wastes represent more than 40% of total plant food (like mango, papaya, pineapple, citrus fruits, artichoke, and asparagus) (Liu et al. 2012). Food by-products know to minerals, sugars, and organic acids, bioactive constituents as flavonoids, carotenoids, and polyphenols parallel to their essential counterparts. Because of this phytochemical composition, finding natural chemical constituents are as an alternate for synthetic substances. The by-products in industrial fields are used in food, pharmaceuticals, nutraceuticals, and cosmetics.

Table 19.8 Percentages of by-products generated from fruits and vegetables processing industries

Plant	Edible part (%)	% of by-products
Agave	60	40 (rind and pith)
Apple	89	11 (pulp and seed core)
Artichoke	40	60 (outer bracts, receptacles, and stems)
Asparagus	50–60	40–50 (spear)
Banana	70	30 (peel)
Cactus cladodes	80	20 (spines, glochids, and peel)
Carrot	60–70	30–40 (pomace)
Mandarin	84	16 (peels)
Mango	58	42 (seeds, peels, unusable pulp)
Citrus fruits	44	66 (peel)
Papaya	53	47 (seeds, peels, unusable pulp)
Passion fruit	25	75 (rind and seeds)
Pineapple	48	52 (core, peels, top, pulp)
Potato	60–85	15–40 (peel)
Tomato	93–97	3–7 (peel and seeds)

19.8.1 By-Products from Citrus Fruits

Rutaceae (citrus family plants) also known as *agrumes* are one of the largest fruit crops worldwide. Citrus fruits are rich in vitamin C (citric acid) and vitamin B (like thiamin, niacin, pyridoxine, riboflavin, pantothenic acid, and folate), as well as flavonoids, limonoids, and carotenoids chemical constituents are present. These ingredients are the major source of dietary fibers, lowered circulating cholesterol, and gastrointestinal diseases. Citrus fruits contribute to human diet and exhibit good antioxidant properties. From citrus family, some of them are eaten fresh such as grapes, oranges, and tangerins, as well as others around 85% of industrial processed consumption such as lemon and orange juices. Phytochemicals of these natural sources are used for human color for skin, hair color, and eyes, as well as skin protection from ultraviolet radiation. Ethanol extracts waste by-products from the citrus family shown potential antimicrobial, antioxidant, and anti-inflammatory properties, because these extracts are major source of essential oils and flavonoids. Essential oils are used particularly as preservatives against spoilage, pharmaceuticals, and cosmetics. For example, *C. unshiu* peel essential oils composed of limonene (80.5%), γ -terpinene (6.80%), and cymene (4.02%) are major compounds. These essential oils exhibit potential antibacterial activity, anti-inflammatory, antimicrobial, and antioxidant properties. Essential oils and extracts of citrus family by-products are used as hair and skin care products.

19.8.2 By-Products from Tomato and Olive

Tomato and olive are the most important food products worldwide. Tomato and olive oil food processed products are mainly located in the Mediterranean areas and shipped worldwide.

The annual production of tomato in the world is around 160 million tons, about 40 million tons of which are processed such as tomato peel, tomato paste, unpeeled, and chopped tomatoes (Tomato Processing industries 2014). High amount of important tomato by-products (peels, pulps, and seed) generated due to tomato processed industrially are rich in lycopene which has antioxidant properties, and used for disease prevention. Tomatoes are highly demanded for food, pharmaceuticals, and cosmetic industries. Lycopene is extracted from peel approximately five times more than pulp. Extraction of lycopene commercially is expensive due to its difficult extraction process. Tomatoes by-products' high moisture content and sensitivity to microbial spoilage make the storage and processing of this material problematic (Papaioannou and Karabelas 2012). Hence, lycopene ensuring to be used in food and cosmetic industry (Papaioannou and Karabelas 2012).

Mediterranean diet olive oil has most important to improve health status in terms of heart disease. It is already know that olive oils are principle ingredients which are used to variety of cosmetic products such as face and body creams, soaps, lotions, shampoos, body massage oil, and hair oils. Olive oils by-products are composed of phenolic compounds and monounsaturated fatty acids. Olive oil and by-products show potential biological activity in epithelial, endothelial, platelets, neurons, neoplastic cells, and immune system. By-products are composed of phenolic compounds such as hydroxytyrosol, oleuropein, and other derivates show in vivo and in vitro antioxidant property. A lot of research efforts were published especially about oleuropein and its pharmacological activities which include anti-inflammatory, anti-atherogenic, anti-cancer, antimicrobial, antiviral, antioxidant, hypoglycemic, and hypolipidemic effect (Omar 2010). Olive oil and its by-products already known to skin and hair care products.

19.8.3 By-Products Processing from Coffee

Coffee is among the most crops generating large amount of by-products in the coffee processing industry. Globally, coffee (*C. arabica* and *C. robusta*) is usually cultivated in South Asia, India, Latin America, and Africa. By-products of coffee are produced from the coffee pulp and husk processing, it has less applications such as prepare compost, fertilizer, and livestock feed (Murthy and Naidu 2012). While collection and selection of coffee beans some of coffee berries are unused green beans, they have been mechanically damaged and sufficiently ripe and big to pass the next processing step. The green beans have valuable antioxidants, which not yet been broken by the roasting process (Murthy and Naidu 2012).

Otherwise, the unroasted beans are extracted with water, carbon dioxide, and ethanol; these extracts are rich in bioactive antioxidant constituents. The removal of ethanol from the extract results in jelly like extract which is used to improve the skin tone, natural skin cell renewal, reinforced the epidermal barrier, and decreasing inflammatory process.

19.9 Future Prospects and Conclusions

This chapter presents the selected plants extracts and their by-products used in the preparation of cosmetic products worldwide. Globally, more than 5,000 plants are used in cosmetics and cosmeceuticals. Currently to develop cosmetics and cosmeceuticals, natural products are untapped reservoir.

This clench identifying and developing many plants-derived natural beauty products. For occasion *B. orellana* L (Fig. 19.7) seed extracts are used for orange-red wax or lipstick plant, Amazon base native people has been used for body and facial embellishment, as well as used in lipsticks, powders, nail polishes, eye shadows, and cream blushes. Baobab (*Adansonia digitata* L) is generally known as monkey tree or upside-down tree. It is native of Madagascar and southwest of Africa. This plant seed extracts have been used for normal and dry skin anti-irritating, antioxidant, and anti-sensitizing as well as hair and nail conditioning purpose (Hetta 2016a, b). Mafura (*Trichilia emetica* L.) common name Natal mahogany is growing in Zimbabwe, Sudan, South Africa, and Uganda. Its plant extracts show potential antioxidant, and anti-inflammatory effects, preparing

Fig. 19.7 Seeds of the annatto *Bixa orellana* L. (Bixaceae)



natural soaps, making candles, as well as used for hair and skin care products traditionally (Hetta 2016a, b). *Ximenia american* L. (common name Sour plum), it has been distributed in Africa. Extracts of this plant are used in traditional medicinal system like skin problems, angina, fever, toothache, and others, it is also used traditionally in cosmetics such as lipsticks, lubricant, soaps, vegetable butters, emollient, conditioner, body massage oil, hair oil and conditioner and skin softener (Hetta 2016a, b). The early shoots of *C. aurantium* L. (sour orange) chewed for fresh breath in elderly age women's in Creole as well as essential oils from this plant might be used in soaps, skin care products, deodorants, and mouthwashes. Essential oils from seeds of *D. odorata* are extensively used in perfumes industry due to major amounts of coumarins with pleasant odors and also used in preparation of skin and hair care products.

Moreover, an important pathology to take advantage of these opportunities to develop active chemical constituents, mechanism and its characterization must be necessary for cosmetics and cosmaseuticals. For example, *A. vera* is used for wound healing, but it needs high level of supporting evidence and its promoting activity, *A. vera* analog products are used as topical agents for treatment of skin lesion (Pereira and Bártolo 2016). *E. olearacea* products are used worldwide in most foods, cosmetics, and cosmeceuticals; but, health and scientific evidence are still insufficient (Yamaguchi et al. 2015). *M. citrifolia* fruits are used in general health disease, power and energy drinks, fruit juices as well as leaves formulated as capsules or pills high in demand. But most of assert of noni plant products are not carried by hard scientific evidence (Assi et al. 2017).

Over few decades, enormous understanding of cosmetic skin formulations and skin biology was developed. Different types of commercial cosmetics are available for skin care products such as skin whitening, skin protection lotions, skin creams, and anti-ageing. Several natural products are serving cosmetic industry in addition to their medicinal benefits to the skin. More research efforts are required for delivery of natural products cosmaceuticals ingredients and report of their activities in cosmetic field could lead the development in the next decade.

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