HERBAL PLANTS USED IN COSMETICS AND COSMECEUTICALS AND THEIR ADVANTAGES OVER THE SYNTHETIC COUNTERPARTS

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Summary

Cosmetics are commercially available products that are used to improve the appearance of the skin. Even though the cosmetic field is closely related to the pharmaceutical or food industry, the expectations of cosmetic product consumers and their needs are completely different. They are more sophisticated and are looking for safe cosmetic products that actually do something beneficial to their skin. This is in contrast to the cosmetic legislation which says that only pharmaceutical products are allowed to really act on the body and skin on a systemic way. So the big challenge for the cosmetic industry is to combine these two contradictory needs and to fulfill both requirements. They have to provide functional and safe products. Compared to other beauty products, natural cosmetics are safe to use. Cosmeceuticals are cosmetic-pharmaceutical hybrid products intended to improve the health and beauty of the skin by providing a specific result, ranging from acne-control and anti-wrinkle effects, to sun protection. These products improve the functioning/texture of the skin by boosting collagen growth by eradicating harmful effects of free radicals, maintains keratin structure in good condition and making the skin healthier. There are numerous herbs available naturally having different uses in cosmetic preparations for skincare, hair care and as antioxidants. There are numerous herbal plants available naturally; having different chemical constituents used in cosmetics preparations. Some of the plants commonly used as cosmeceuticals are *Aloe vera, Azadirachta indica, Curcuma longa*, Coconut oil, Sunflower oil, *Rhodiola rosea* (Golden root), *Daucus carota*, *Ginkgo biloba, Lawsonia inermis, Camellia sinensis, Acorus calamus, Allium sativum, Alpinia galangal, Avena sativa, Echinacea purpurea, Centella asiatica, Symphytum officinale, Crocus sativus, Vitex negundo, Sesamum indicum, Cicer aritinuma* to name the few. The current chapter would therefore highlight the importance of studies of herbal cosmetics, the herbs used in them and their advantages over the synthetic ones.

1. Introduction and Background

Since ancient times women have turned to the beauties of nature to help or increase their own beauty. The concept of beautifying is not only restricted to women alone, even men have become aware of their looks.

Cosmetics are commercially available products that are used to improve the appearance of the skin (Mary and Lupo, 2001). The skin is the largest organ; as our primary external barrier, it is on the forefront of the battle with external causes of damaging free radicals. Ultraviolet light and environmental pollutants are known initiators of free radicals. Free radicals are highly reactive molecules with an unpaired electron that result in damage to surrounding molecules and tissues. The most significant damage by free radicals is caused to bio-membranes and DNA. It is thought that additional, topical use of vitamins (A, B, C, E, K) and antioxidants in cosmetics can better protect and possibly correct the damage by neutralizing these free radicals. In addition, some vitamins may be beneficial to the skin because of other actions such as effects of suppression of pigmentation and bruising, stimulation of collagen production, refinement of keratinization, or anti-inflammatory effects.

By the European Directives 93/35/EEC (European Commission), the 'cosmetic products' are defined as any substance or preparation intended to be placed in contact with the various external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance and/or correcting body odors and/or protecting them or keeping them in good condition (European Commission, 1993). There is now, however, growing scientific evidence that plants possess a vast and complex arsenal of active ingredients (phytochemical) able not only to calm or smooth the skin but actively restore, heal and protect the skin.

The word cosmetic was derived from the Greek word "Kosmtikos" meaning "skilled in adornment or arrangement" -having the power and skill in arranging and decorating. The origin of cosmetics forms a continuous narrative throughout the history of man as they developed. The man in prehistoric times 3000 BC used colors for decoration to attract the animals that he wished to hunt and also the man survived attack from the enemy by coloring his skin and adorned his body for protection to provoke fear in enemy. The origin of cosmetic was associated with hunting, fighting and superstition and later associated with medicine.

Even though the cosmetic field is closely related to the pharmaceutical or food industry, the expectations of cosmetic product consumers and their needs are completely different. They are more sophisticated and are looking for safe cosmetic products that actually do something beneficial to their skin.

Indian herbs and its significance are popular worldwide. Herbal cosmetics have growing demand in the world market and are an invaluable gift of nature. Herbal formulations have always attracted considerable attention because of their good activity and comparatively lesser or nil side effects with synthetic drugs. Herbs and spices have been used in maintaining and enhancing human beauty since time immemorial. Indian women have long used herbs such as sandalwood and turmeric for skin care; henna to color the hair, palms and soles; and natural oils to perfume their bodies. Besides this, elaborate herbal beauty treatments were carried out in the royal palaces of India to heighten sensual appeal and maintain general hygiene.

Herbal cosmetics are the preparations used to enhance and improve the human appearance. The bioactive ingredients from botanicals include vitamins, antioxidants, various oils, essential oils, dyes etc. which serve as cosmetics for care of body and its parts. The herbal cosmetics used for daily purposes include herbal face wash, herbal conditioner, herbal shampoo etc. herbal cosmetics are formulated using different cosmetic ingredients to form the base in which one or more herbal ingredients are used to cure various skin aliments.

The key cosmeceuticals used by men alone include hair growth products, anti-ageing, anti-perspirant, athlete's foot and astringents. Cosmeceuticals most commonly used by women include anti-wrinkles, anti-cellulite, hair removal, tanning, skin whitening, antioxidants and cell recovery products (Philips, 2009).

Cosmeceuticals are the future generations of skin care. They are the advances made within the world of dermatological products and the new beckon in skin care. Cosmeceuticals are topical cosmetic-pharmaceutical hybrids intended to enhance the health and beauty of skin. Some cosmeceuticals are naturally-derived while others are synthetic; but all contain functional ingredients with either therapeutic, disease fighting or healing properties.

The concept propounded by Dr. Albert Kligman states that "The cosmeceuticals are topical agents distributed across a broad spectrum of materials lying somewhere among pure cosmetics (lipstick and rouge) and pure drugs (antibiotics, corticosteroids). They partake of both categories" (Kligman, 2000). Cosmeceuticals improve appearance, but they do so by delivering nutrients necessary for healthy skin.

The requirements for the basic skin care include the use of the following components in any skin formulation:

- **Cleansing agent**- which remove the dusty, dead cells and dirt that chokes the pores on the skin. Some of the common cleansers include vegetable oils like coconut and palm oil.
- **Toners**- The toners help to tighten the skin and keep it from being exposed to many of the toxins that are floating in the air or other environmental pollutants. Some of the herbs as toners are witch hazel, geranium, sage, lemon, ivy burdock and essential oils.
- **Moisturizers**- The moisturizing helps the skin to become soft ad supple. Moisturizing shows healthy glow and are less prone to aging. Some of the herbal moisturizers include vegetable glycerin, sorbitol, rose water, jojoba oil, aloe vera and iris.

2. History of Cosmeceuticals

Raymond Reed, founder of the US Society of cosmetic chemists, created the concept of "cosmeceutical" in 1961. Further the term "cosmeceutical" was popularized by American dermatologist Albert Kligman in the late 1970s. However, the Egyptians were the first to recognize the health-giving properties of cosmetics. The "Ebers" a medical papyrus wrote in 1600 BC, made frequent reference to several cosmeceutical-type products. A favorite formulation was using honey and milk that claimed to help cure skin diseases.

For many medieval Arab physicians and their European counterparts, there were no distinctions among cosmetics, fragrances and herbal medicines. Their research and development work covered all these disciplines simultaneously. Separation of the cosmetic and toiletries industry from medicine, and pharmacy was in 19th century. This phenomenon occurred when the modern pharmaceutical industry was first developed and the first government statue regulating the sale of drugs was drafted.

The role of cosmetics as a positive healing aid ignored until its revival in the late 1970s and early '80s. Kligman rekindled interest by developing formulations to improve the appearance of UV-damaged and wrinkled skin using retinoic acid as the active ingredient (Philips, 2009).

3. Herbal Ingredients as Cosmeceuticals

Plant extracts and the use of plant parts such as leaves, fruits, flowers, stems, barks, buds and roots are known in cosmetic and pharmaceutical applications since ancient times. They are wide spread and where used for purposes such as moisturizing, whitening, tanning, color cosmetics, sunscreen, radical-scavenging, antioxidant, immune-stimulant, washings, preservatives, thickeners etc. Along with the growth in the use of advance scientific and pharmaceutical ingredients in skin care, there is an opposing trend that rejects synthetic chemicals in beauty products. This trend is reflected in the steady growth of natural/organic personal care products, which often avoid ingredients like parabens and other synthetic preservatives, phthalates (solvents often used in fragrances), silicones, petrochemical derivatives (like mineral oil), sulfates (like sodium lauryl sulfate), and chemical sunscreens (Goliath, 2009). Many cosmetic products have claimed biological functions such as anti-wrinkle, anti-aging, anti-acne, de-pigmentation, etc. To take real effect on the skin, the biologically active ingredients should be absorbed in to the skin. For that reason, topical delivery of active ingredients has gained considerable interest in cosmetic science (Zatz, 2000; Wiechers, 2000).

4. Market Demand of Cosmetics and Cosmeceuticals

Skin care industry has evolved and innovated beyond the scope of most current regulatory systems. Hybrid products that challenge the boundaries between cosmetics, pharmaceuticals, and nutritional supplements and the growing number of claims for natural/ organic products demand further regulation. Globalization and the internet create the need for common standards across regions. Global brands can significantly benefit from cohesive standards that can enable product development and marketing, and the internet makes products available globally-crossing regulatory lines-almost instantly (Nagochi and Nikki, 2000). Anti-aging is among the most dynamic of all cosmetics and toiletries categories when it comes to pace and breadth of innovation. Consumer demand for new and better ways to reverse, delay, and prevent signs of skin aging is high and increasing. This, coupled with significant scientific advances and relentless competitive pressures, ensures that there is never a lull in the category's innovation pipeline. Not all innovation spaces are equal, though. Some meaningfully shift consumers' expectations at large, while others result in specialized niches with fewer but highly committed followers (Montague-Jones, 2009).

5. Market Survey

Skin care is truly a global business, with the biggest regions, according to Euro monitor data, being Asia Pacific (40%) and Western Europe (29%). North America is about 14% of the total market (Kirillov, 2008). While developed Asian markets are the largest for skin care as a whole (Japan and South Korea rank No.1 and No.3 in skin care sales globally), anti-aging significantly lags behind in importance as compared to whitening products. In Japan, for example, antiaging only accounts for about 10% of sales, while it exceeds 30% in the US and the UK, according to Euro monitor International. Other large developed markets where anti-aging is of great importance are France, Australia, Italy, Germany and Spain (Kirillov, 2008).

6. Gender-specific Cosmeceuticals

The concept of beautifying is not restricted to women alone, even men have become aware about their look. Key cosmeceuticals used by men include hair growth products, anti-ageing, anti-wrinkle, anti-perspirant, athlete's foot and astringents. Cosmeceuticals most commonly used by women include anti-wrinkles, anti-cellulite, hair removal, tanning, skin whitening, antioxidants and cell recovery products (Philips, 2009).

Herbal Cosmetics Can Be Grouped into Following Major Categories
1. Cosmetics for enhancing the appearance of facial skin.
2. Cosmetics for hair growth and care
3. Cosmetics for skin care, especially in teenager (acne, pimples and sustaining)
4. Shampoos, soaps, powders and perfumery, etc.
5. Miscellaneous products.

7. Cosmetic Vs Drug

There are multiple slightly variable definitions of both 'drugs' and 'cosmetics'. The term 'cosmetic' refers to a preparation designed to enhance the body superficially to hide a real comprehended deficiency or flaw, by direct application. This application is considered to be decorative, lacking in depth or significance, as opposed to a response to a medical requirement. Individual governments regulate the availability or drugs to the public.

1. Over-the-counter (OTC) medication is available from pharmacies.
2. Behind-the-counter medication (BTC) must be dispensed by pharmacist, but does not require the authority of a doctor, and finally
3. Prescription-only medicine (POM) can only be prescribed by a licensed medical professional.

There are also numerous bodies that regulate the drugs present in the market:
a) The Medicines and Healthcare Products Regulatory Agency (MHRA) - is a government agency responsible for ensuring that medicines and medical devices work and are acceptably safe. They are responsible for public information as well the investigation and handling of complaints and patient feedback.
b) The National Biological Standards Board (NBSB) - is a non-departmental public body, established in 1975 by Act of Parliament. The board takes responsibility for safe- guarding and advancing public health by assuring the following.

8. Cosmeceuticals: Ayurveda and Skin Care

The aspiration for light skin (fair complexion) is becoming pronounced in a greater number of people in the present times with natural products being more in demand than their synthetic counterparts. Research in the area of skin-lightening agents is an expanding field with the knowledge being updated regularly. In Ayurveda, **varnya, raktaprasadana, tvacya* are few terms specifying skin lightening with respect to its modern counterpart i.e., Tyrosinase inhibition, the most commonly reported method of skin lightening.

The contemporary concept of wellness includes beauty, health, fitness as well as anti-aging aspects (Datta and Paramesh, 2010). Beauty, especially fairness of skin, is a subject of socio-medical importance and has given rise to many skin-lightening procedures such as dermabrasion, ultrasound, and laser therapy (Reszko et al., 2009). Unhealthy skin gives rise to social issues whereas healthy-intact skin increases cheerfulness and confidence. Traditional herbal medicines provide an interesting source for development of new skin-care cosmetics. Indian Cosmetic market is growing at 15-20% annually, twice as fast as two leading countries i.e. US and EU market (Halliwell et al., 1995). The unique, effective, and long lasting concept of beauty in Ayurveda has led to the emergence of Ayur-cosmeceuticals.

Stratum corneum of the skin forms an excellent barrier to external application and it is necessary to employ some penetration enhancers or appropriate vehicles to increase the skin permeation of the active ingredients. The use of phospholipids to increase skin permeation has been studied widely. Phospholipids are used in solubilized form as penetration enhancers (Yokomizo and Sagitani, 1996; Raghavan, 2007). The major advantage of phospholipids is a lower level of the tendency toward the inducement of skin irritation, compared with that of typical penetration enhancers (Sasaki et al., 1990; Ghosh et al., 1997). Today, the basic development of cosmeceutical product is not just for cleanse, protect and moisturize, but to incorporate the antioxidants in skin care products. Consumers are increasingly looking to maintain youth and vitality. The concept of free radical damage has highlighted the importance of antioxidants and nutritional supplementation in maintaining health; cosmetics and topical creams are a vital component of this movement. There are considerable data to suggest the benefits of such ingredients in cosmetics. Free radicals are highly reactive molecules or chemical species containing unpaired electrons that cause oxidative stress, which is defined as "an imbalance between oxidants and antioxidants in favor of the oxidants, potentially leading to damage" (Sies, 1997). Oxidative stress can damage lipids, proteins, enzymes, carbohydrates and DNA in cells and tissues, resulting in membrane damage, fragmentation or random cross linking of molecules like DNA, enzymes and structural proteins and even lead to cell death induced by DNA fragmentation and lipid peroxidation (Beckman and Ames, 1998).

Ayurvedic literature describes over 200 herbs and minerals to maintain and enhance the beauty of the skin (Datta et al., 2011). A few herbs evaluated for skin whitening effect from **varnya mahakaṣaya* (Shastri, 2007) **lodhradi varnya gana (Sharma, 2009)*, **eladi varna prasadana gana (*Sharma, 2009) and a few *varnya* formulations viz. **haridra khasha (*Shastri, 2005), *nimbadi* **curnai (*Shastri, 2005), *candanadi taila (*Shastri, 2005), *kunkumadi taila (*Shastri, 2005) **kanakarista (*Tripathi, 2003).

The herbs and their action are described below.

8.1. Sveta Chandana (Santalum album)

Being considered as a symbol of vitality, it is commonly used as a cosmetic and in skin care. It is suitable for all types of skin. Sandalwood is used in cosmetic products to freshen and revitalize dull skin. Sandalwood paste is known not only to have curative powers to heal skin problems, but also a glow to the skin which is unmatched by any

other product. Sandalwood is also used for face packs and scrubs to remove dead cells, regenerate growth of new cells and give a young look (Utkarsha et al., 2017).

Sandalwood oil being rich in sesquiterpenoid alcohols (80-90%) (Burdock and Carabin, 2014) is mainly used in numerous skin fairness enhancing cosmetics and had shown low acute oral and dermal toxicity in lab animals. Recent studies have indicated that α-santalol, the major constituent of the sandalwood oil, is a potent inhibitor of tyrosinase (IC50 = 171μg/mL) as compared to kojic acid and arbutin (IC_{50}–149μg/ml) showing great potential for use in skin-care (Mishra, 2011).

Figure 8.1. *Santalum album*

8.2. *Madhuyasti (Glycyrrhiza glabra)

Figure 8.2. *Glycyrrhiza glabra*

Liquorice root offers skin de-pigmenting, lightening, emollient, anti-acne, photo protection, antiaging, antimicrobial and antioxidant properties, all helpful for a healthy skin. Role of *G. glabra* on skin is mainly attributed to its antioxidant activity of phytochemicals namely triterpene, saponins (Glycyrrhizin-salts of glycyrrhizic acid) and flavonoids. Glycyrrhizetic acid controls the secretion of melanin in skin and it has the effect of reducing dark pigmentation and making the complexion fairer. Methanolic extract of its rhizome has been reported to be a potent tyrosinase inhibitor in human skin with more than 75% inhibition. The IC_{50} value was found to be within range when compared to well-known skin whitening agent i.e. Kojic acid (Vaibhav and Lakshaman, 2012) Therefore, it is likely to be useful for cosmetic applications.

8.3. *Manjistha (*Rubia cordifolia*)

It holds the reputation of a very good skin care herb as is used to make the complexion even and lighten dark spots. Ayurvedic texts enumerate its qualities to be: **Varnya, rakta prasadaka, rakta sodhaka* (*blood purifier*). Chemically, it contains glucosides known as Manjisthin and Purpurine, along with resins, lime salts and coloring agents. Methanolic extract of this herb has been reported to show 14.80% mean inhibition of tyrosinase activity thereby acting as skin whitening agent (Prabhajit et al., 2008).

Figure 8.3. *Rubia cordifoli*

8.4. Nagakesara (*Mesua ferrea*)

Although it is not popular as a skin care herb but the scientific screening of this plant has confirmed its antioxidant, blood purifier effect along with its potential use in cosmetics. Phytochemically, phenyl coumarins, xanthones, triterpenoids, flavanoids are mainly held responsible for its biological activity. A study has revealed its potent antioxidant activity comparable to that of standard ascorbic acid. In another study solvent extract of chestnut flowers (*Naagkesara*) has shown to exhibit remarkable mushroom tyrosinase inhibitory activity as effectively as arbutin and protection against

ultraviolet (UV) rays making it a strong candidate for use in cosmetics (Sapkota et al., 2012).

Figure 8.4. *Mesua ferrea*

8.5. Padmaka (*Prunus cerasoides*)

Figure 8.5. *Prunus cerasoides*

The use of *Padmaka* as skin care herb is well documented in both Ayurveda (used in leprosy, leucodermaa, erysipelas) and in biomedicine, even then it is not a popular cosmetic herb. Recently, a new flavanone glycoside Puddumin-B, (naringenin-4-methyl-ether-7-O-β-D-galactoside) has been isolated from *Prunus cerasoides* which exhibited anti-melanogenesis activity by suppression of tyrosinase protein making it a suitable candidate for skin whitening (Murata et al., 2014).

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Biographical Sketch

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