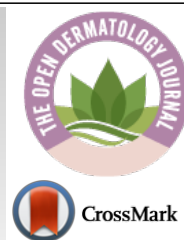


# The Open Dermatology Journal

Content list available at: <https://opendermatologyjournal.com>



## REVIEW ARTICLE

### Current Review on Herbs for Derma Care

Rashmi Saxena Pal<sup>1,\*</sup>, Yogendra Pal<sup>1</sup>, Nikita Saraswat<sup>1</sup>, Pranay Wal<sup>1</sup> and Ankita Wal<sup>1</sup>

<sup>1</sup>Department of Pharmacy, PSIT Kanpur, NH-2, Bhauti, PSIT, Kanpur, India

#### Abstract:

#### Background:

A large number of cosmetic formulations have been developed based on herbs. Indian women have been using herbs such as sandalwood, aloe for skincare protection, since ages. In India, the rich cultural heritage is behind the materials used in cosmetics from the earliest period of medical and cosmetic art.

#### Objective:

Continuous application of synthetic compounds on the skin causes many adverse effects such as skin irritation, allergy, discoloration, rashes along with skin cancer. The aim of this review article is to explore herbs for different skincare needs.

#### Materials and Methods:

A literature search was done on various herbs used for skin nourishment, cleansing, sun-screens, bleach, anti-ageing, moisturization and other skin requirements.

#### Results:

There are various herbs present in nature. They improve and clarify skin gently in an utmost manner.

#### Conclusion:

These herbs are full of phytoconstituents, having natural goodness to fulfill the different demands of skin.

**Keywords:** Periodontal disease, Psoriasis, *Porphyromonas gingivalis*, Herbs, Derma care, Skin care.

#### Article History

Received: May 22, 2019

Revised: July 30, 2019

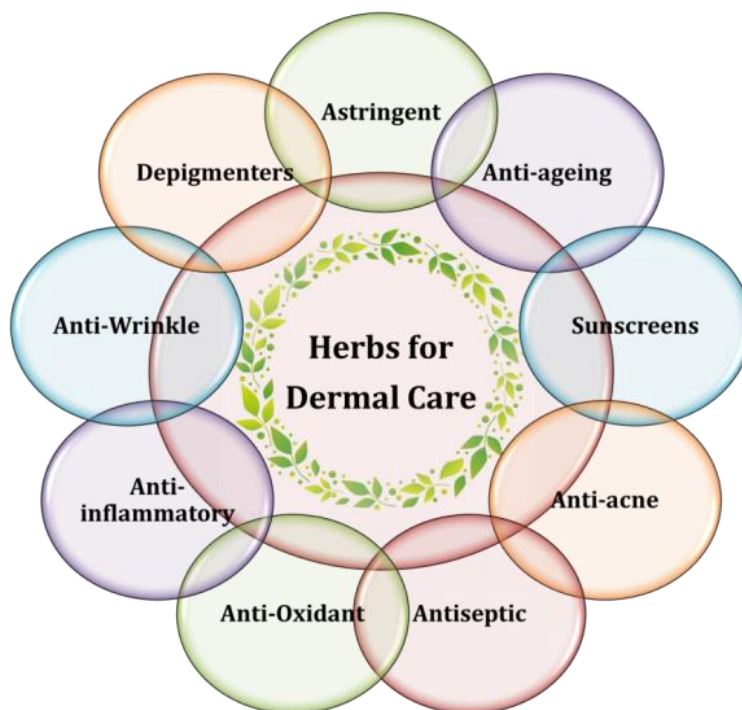
Accepted: August 20, 2019

## 1. INTRODUCTION

Ayurveda makes use of many herbs to make cosmetics for beautification and protection from external effects. The natural phytoconstituents not causes any side effects on the human body; but provide nutrients and other useful minerals to the body [1]. Herbal cosmetics or products are made from various cosmetic ingredients to form the base in which one or more herbal ingredients are incorporated for defined cosmetic benefits [2]. The health, habits, job routine, climatic conditions and maintenance are mainly responsible for the skin and hair beauty [3]. Excessive exposure to heat, the causes skin to dehydrate during summer and causes wrinkles, blemishes, pigmentation and sunburns. Extremes of winter causes damages to the skin and hairs in the form of cracks, cuts,

infections, hair fall and dandruff [4]. The diseases of skin are common among all age groups and can be due to exposure towards microbes, chemical agents, biological toxins, and also due to malnutrition [5]. large number of herbs are available commercially as cosmetics for skincare, hair care and anti-oxidant effects. These herbal formulations produce cleansing and beautifying effects and improves overall appearance when rubbed, poured, sprayed externally or applied to body parts [6 - 10]. Cosmetics from natural sources are considered better and safer [11]. Plants are the natural sources of cosmetic formulations. They can be used to design some useful inorganic materials that are called green synthesis. [12] They are made from original ingredients in plants, leaves, roots, fruits and flowers which have properties for health and beauty [13]. Major chemical compounds in plants are alkaloids, flavonoids, terpenoids, steroids, tannins and saponins which can be assessed by phy-

\* Address correspondence to this author at the Department of Pharmacy, PSIT Kanpur, NH-2, Bhauti, PSIT, Kanpur, India; Tel: 9129826459; E-mail: rashmisaxenapal@gmail.com



**Fig. (1).** Herbs used for Dermal Care.

tochemical screening. Herbs serve as important cosmeceuticals as they do not carry any adverse effects [14]. They can be categorized as shown in Fig. (1).

## 2. METHODS

Literature was studied in order to obtain the information about herbs that play an important role in skin care and its various complications. The search was done on Google scholar, MEDSCAPE, BMC, Science Direct, MEDLINE database, SCOPED and other relevant databases, using keywords like herbs, skin, phytoconstituents, care *etc.* The information was also extracted from various Ayurvedic treatises, textbooks of Ayurveda and books of Pharmacognosy available in the Library of Pranveer Singh Institute of Technology, Kanpur, and NBRI Lucknow. Available dissertations/thesis and various research articles were also investigated.

### 2.1. Herbs With Anti-Acne Effects

Acne develops when pores become clogged or infected with bacteria. Acne is the most common skin condition, affecting around 80 percent of people in their lifetime [15].

#### 2.1.1. Green Tea

It contains high concentrations of polyphenol antioxidants called catechins. Most people with acne produces lots of sebum or natural body oil in their pores and lack enough antioxidants. Sebum secretion is associated with hormonal activity in the human body [16] and excess sebum production causes skin disorders, such as acne vulgaris. Antioxidants help the body to break down chemicals and waste products that can damage healthy cells. Green tea clears out some of the debris and waste that causes open acne sores. It contains compounds that may

help to reduce sebum production and inflammation. Components of green tea beverage measured as weight percentage of extract solids include 30%–42% catechins, 5%–10% flavonols, and 2%–4% other flavonoids [17]. Catechins are divided into catechins, epicatechins, epicatechin gallates, epigallocatechin, and epigallocatechin-3-gallate, which are mainly responsible for the anti-oxidant property of green tea. Green tea is available in the form of serums and hydrating lotions [18, 19].

#### 2.1.2. Manjishtha

Manjishtha is reputed as an efficient blood purifier and hence is extensively used against blood, skin and urinary diseases. Manjishtha is used externally on major burns, mixed with honey and on freckles and blemishes. It is a potent drug for severe skin diseases [20]. Methanolic extract of *Rubia cordifolia* inhibits proliferation of acne. It is moderately effective against TNF alpha and shows low activity against IL-8. It is regarded as an astringent and treats external inflammations like ulcers and skin diseases. The anthraquinone rich fraction of a plant in a gel formulation shows anti-acne activity against *Propionibacterium acne*, *Staphylococcus epidermidis*, and *Malassezia furfur*, as compared with the standard Clindamycin gel. Manjishtha is available in the form of gel and ointments [21 - 25].

### 2.2. Herbs With Anti-Inflammatory Effects

Inflammation is a defense response of our body to hazardous stimuli such as allergens or injury to the tissues. Uncontrolled inflammatory response is the main cause of a vast continuum of problems such as allergies.

### 2.2.1. Aloe-vera

Aloe vera inhibits the cyclooxygenase pathway and reduces prostaglandin E2 production from arachidonic acid. It is used in the form of soothing gels [26 - 28].

### 2.2.2. Sandalwood

For more than 4000 years, *Santalum album L.*, belonging to the family Santalaceae has been used mainly in religious rituals as fragrance and is also used as a flavouring agent in Ayurvedic medicine to manage inflammatory reactions initiating various skin disorders [29, 30]. In addition, it has been used as an astringent. It is used in the form of face packs, masks, etc. [31 - 34].

## 2.3. Herbs With Anti-Oxidant Effects

Antioxidant concept refers to mechanisms for staving off "free-radical" reactions. Such "radicals" have definitively been shown to affect all biochemical components such as DNA/RNA, carbohydrates, unsaturated lipids, proteins and micronutrients such as carotenoids, vitamins A, B6, B12, and folate [35, 36].

### 2.3.1. Amla

Nature has gifted *Emblica officinalis* with defensive antioxidant mechanisms, superoxide dismutase, catalase, glutathione, GSH peroxidases, reductase, Vitamin E, Vitamin C, etc., along with several dietary components. Diverse potential applications of antioxidant or free radical manipulations in the prevention or control of disease have been revealed by several researches. The fruit extract produces positive responses in total phenol, total flavonoids and total tannin assays, that is used in the form of a scrub [37, 38].

### 2.3.2. Rosemary

*Rosmarinus officinalis L.* is a rich source of phenolic compounds and its properties are derived from its extracts and essential oils. Extracts of rosemary also contain several antioxidant and volatile components such as phenolic acids, flavonoids, and diterpenoids. There are seven main flavonoids in rosemary leaves, flowers, roots and stem. Rosemary oil hydrates the skin, which helps to control oil production. It also provides an antibacterial surface to the skin, keeping acne at bay. The presence of 7-O-glucoside, hispidulin, diosmin, hesperidin, 3'-o- $\beta$ -D-glucuronide, genkwanin and isoscutellarein 7-O-glucoside has been studied. They play an important role in anti-ageing [39 - 41].

## 2.4. Herbs With Anti-Wrinkle Effects

The botanical ingredients present in herbal cosmetics impact biological functions of the skin and provide the nutrients required for a healthy skin. The imperative efforts associated with medicinal plants with scientifically validated mechanism leads to the emergence of novel cosmeceuticals for the prevention of sagging [42, 43].

### 2.4.1. Apricot

The vitamins A, C, and E,  $\beta$ -carotene and selenium

contents of apricot showed wrinkle prevention qualities. The total oil content of its kernels ranged from 40.23 to 53.19%. Oleic acid contributed 70.83%, followed by linoleic acid 21.96%, palmitic acid 4.92% and stearic acid 1.21% as fatty acids. It was reported in another study that the seed oil is a rich source of P, Ca, Mg, Fe and Cu, and contained 73.58% oleic acid. It is used in the form of sheet or scrub [44, 45].

## 2.5. Herbs with Depigmentation Effects

Depigmentation is the lightening of the skin, or loss of pigment. Depigmentation of the skin is due to a number of local and systemic conditions. Pigment loss can be partial or complete. It can be temporary such as in tinea versicolor or permanent such as in albinism [46, 47].

### 2.5.1. Papaya

Some constituents of leaf of *Carica papaya* are myrosin, alkaloids, rutin, resin, tannins, carpaine, dehydrocarpaine and pseudocarpaine enzymes, ascorbic acid and saponins. Aliphatic and aromatic hydrocarbons contribute to aroma. On the other hand, the following carotenoids along with vitamin C increases on ripening as lycopene,  $\beta$ -criptoxanthin,  $\beta$ -carotene [44 - 46]. Carotenoids helps in depigmentation of the skin, generally used in the form of face wash, and also help to remove tan.

### 2.5.2. Cucumber

Its extract is rich in vitamins, especially vitamin C and A, which have some cosmetic benefits for the skin, hence it is used to make sheet masks and gel. Cucumber has an excellent potential for cooling, healing an irritated skin, whether caused by sun or due to cutaneous eruption. Cucumber extract is often used for skin problems, wrinkles, sunburn and as an antioxidant [47 - 50]. Cucumber extract is a superfood for skin. The juice is composed largely of proteins, lipids, Vitamin C and a variety of minerals and possesses moisturizing and emollient properties. It also has astringent effects and can soothe and relieve puffy skin.

### 2.5.3. Astringents

Astringents are chemical compounds that help to shrink pores and constrict body tissues. Astringents are used for treating skin irritations, such as acne. They are also used to relieve allergies, insect bites and fungal infections. Astringents work well on oily skin.

## 2.6. Witch Hazel (*Hammamelis Virginiana*)

Witch hazel is an excellent herb with high concentration of tannins, and is a great herbal astringent. The leaves and bark are highly beneficial. Witch hazel is used to protect the skin and the herb can be used to prevent future blemishes as well.

## 2.7. White Oak (*Quercus Alba*)

As another potent astringent, the white oak is a giant tree native to North America. The powerful astringent properties lie in the bark. It is also a high source of tannins and iron. The white oak is used to create skincare products as well. White oak has also been known to treat infections and protect against harmful bacteria [51, 52].

## 2.8. Herbs Used for Anti-aging Treatment

### 2.8.1. Carrot

It is obtained from the plant *Daucus carota* belonging to the family Apiaceae. It is a valuable herb because of its richness in Vitamin A. Carrot seed oil is used as an anti-aging, revitalizing and rejuvenating agent. It gets its bright orange colour from  $\beta$ -carotene and lesser amounts of  $\alpha$ -carotene and  $\gamma$ -carotene.  $\alpha$  and  $\beta$ -carotenes are partly metabolized into Vitamin A. It is available in the form of packs and lotions.

### 2.8.2. Ginkgo

It comes from the ginkgo tree, *Ginkgo biloba*, belonging to the family Ginkgoaceae. It is best known as a circulatory tonic, in particular for strengthening the tiny little capillaries in present the organs, especially in the brain. The capillaries become more flexible with ageing, therefore more oxygen is delivered to the organs as well as skin. Ginkgo is used in the form of micro-foliant [53 - 55].

## 2.9. Herbs With Sunscreen Effects

Sunscreen products are very popular nowadays. Earlier, people would get beautiful sun tan easily and, without the risk of sun burns. Nowadays, it is necessary for to use sunscreen products against ultraviolet radiations.

### 2.9.1. Cucurbita pepo (Pumpkin)

With a lipid profile from the seed containing high levels of linoleic acid (43 – 53%), it contains two classes of antioxidant compounds: Tocopherols and phenolics, which account for 59% of the antioxidant effects. The skin's natural sun blockers are proteins with peptide bonds, absorbing lipids and nucleotides. It is used in the form of hydration mask and serum. The high concentration of plant peptides protects the peptide bonds of the skin proteins. *Cucurbita pepo* seed oil deserves greater recognition, as in the form of masks and serum. With a lipid profile containing high levels of linoleic acid (43 – 53%), it contains two classes of antioxidant compounds: Tocopherols and phenolics, which account for 59% of the antioxidant effects [56].

### 2.9.2. Walnut

The extract is made from the fresh green shells of English walnut, *Juglans regia*. The aqueous extract acts as a self-tanning sunscreen agent. Its most important component is juglone, a naphthol closely related to lawsone. Juglone is known to react with the keratin proteins present in the skin to form sclerojuglonic compounds. These are colored and have UV protection properties. It is used in the form of a scrub to diminish sun damage on skin [57 - 60].

## 2.10. Herbs With Antiseptics Effects

Natural antiseptic herbs are used to kill or inhibit the growth of microorganisms when applied to a living tissue or skin. Antiseptic medicinal herbs reduce the possibilities of infection, sepsis or putrefaction. Plants are a rich source of antibacterial agents with chemical defense against predation or infection. *Morus alba*, *Ocimum sanctum*, *Oxalis corniculata*,

*Piper nigrum*, and *Syzygium aromaticum* belong to this category [61 - 64].

### 2.10.1. Clinacanthus Nutans

It is well known because of its various medicinal uses. *Clinacanthus nutans* or Sabah snake grass is a small shrub that belongs to the family of Acanthaceae and can be found in South East Asia. Ethyl acetate fractions from leaves of this plant are effective against *Bacillus cereus*, *Escherichia coli*, *Salmonella* and *Candida albicans* that use minimum inhibitory concentration and minimum bactericidal or fungicidal assays [65 - 68].

### 2.10.2. Turmeric

It is extensively used as spice, food preservative and coloring material in India, China and South East Asia. Various sesquiterpenes and curcuminoids have been isolated from the rhizome of *Curcuma longa*. They are used in anti-inflammatory wound healing, anticancer and antibacterial activity. Skin conditions such as acne, alopecia, atopic dermatitis, facial photoaging, pruritis and psoriasis. Antioxidants in turmeric protect the skin cells from free radical damage and quickly recover all kinds of wounds due to its antiseptic qualities [69 - 71].

## 3. DISCUSSION

The latest trends in beauty, health and well-being have given rise to a new realm of possibilities by fusing with traditional Indian medicine. They are useful for exploration of possibilities of developing new anti-aging cosmeceuticals with natural ingredients for topical applications. The future for beauty-from-within functional cosmetics is bright, because of multifunctional benefits in the area of anti-oxidant cellular protection and skin health with anti-inflammatory and anti-stress properties. Green tea helps to treat acne sores, while Manjishtha purifies the blood and indirectly facilitates skin. Aloe vera soothes the skin, sandalwood brightens the skin. used as an astringent, while rosemary hydrates the skin. Apricot helps to fight the wrinkles. Papaya and cucumber have an important role in the treatment of pigmentation. Witch hazel and white oak act as astringents. Carrot and Ginkgo act as astringents. Pumpkin and walnut are rich in sun-screen effects. Turmeric is a beneficial antiseptic. Backed by sound science and substantiated structure and function, they offer huge benefits to the cosmeceutical sector. This review may help cosmetic and personal care industry, marketers and modern scientists to understand different trends of potential use to research cosmeceutical approaches to deal with the problems associated with derma care.

## CONCLUSION

In India, more than 70% of the population prefers herbal cosmetics for their health care. Current scenario shows that herbal cosmetics have been marked up in personal care system and there is a great requirement for herbal cosmetics in daily life. The chemical formulation of all these cosmetic products includes the addition of various natural additives, like waxes, oils, natural colours, natural fragrances and parts of plants like

leaves. There is need to do more Research and Development in the field of herbal cosmetics to prove effectiveness and include herbal cosmetics in safety profile. It is important to conduct adequate safety testing as per existing regulatory rule and present requirements. Quality control for ability and safety of herbal cosmetic products is of predominant importance, although it is assumed to be safe for longer periods of time. There are various herbs present in nature that improves and cleanse the skin gently. Above herbs are full of phytoconstituents, having natural goodness to fulfill the requirements of the skin.

## CONSENT FOR PUBLICATION

Not applicable.

## FUNDING

None.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

## ACKNOWLEDGEMENTS

Declared none.

## REFERENCES

- [1] Kapoor VP. Herbal Cosmetics for skin and hair care. *Natural Product Radiance* 306-14.
- [2] Sankholkar DS. Current Regulations and Suggested Way Forward. *Pharm Times* 2009; 41(8): 30-1.
- [3] Prashant L, Kole, Hemant R Jadhav, Prasad Thakurdesai and Anantha Naik Nagappa, cosmetics potential of herbal extracts. *Indian J Nat Prod Resour* 2005; 4(4): 315-21.
- [4] Cosmetics [online], Available from: <http://en.wikipedia.org/wiki/Cosmetics>
- [5] Harry RG. *Modern Cosmeticology*. Chemical Pub. Co. 1962; p. 1.
- [6] Kadam VS, Chintale AG, Deshmukh KP, Nalwad DN. Cosmeceuticals an emerging concept: A comprehensive Review. *Int J Res Pharm Chem* 2013; 3: 308-16.
- [7] Ligade VS, Udupa N. *Pharmaceuticals, Cosmeceuticals and Nutraceuticals: An Overview of Regulations* 2010.
- [8] Mukul S, Surabhi K, Atul N. Cosmeceuticals for the skin: An overview. *Asian J Pharm Clin Res* 2011; 4: 1-6.
- [9] Fowler JF Jr, Woolery-Lloyd H, Waldorf H, Saini R. Innovations in natural ingredients and their use in skin care. *J Drugs Dermatol* 2010; 9(6)(Suppl.): S72-81. [PMID: 20626172]
- [10] Dureja H, Kaushik D, Gupta M, Kumar. Cosmeceuticals: An emerging concept. *Indian J Pharm* 2005; 37: 155-9. [<http://dx.doi.org/10.4103/0253-7613.16211>]
- [11] Chen Q. Evaluate the effectiveness of the natural cosmetic product compared to chemical-based products. *Int J Chem* 2009; 1: 57-9. [<http://dx.doi.org/10.5539/ijc.v1n2p57>]
- [12] Raajshree KR, Durairaj B. Evaluation of the antityrosinase and antioxidant potential of zinc oxide nanoparticles synthesized from the brown seaweed-turbinaria conoides. *Int J Appl Pharm* 2017; 9: 116-20. [<http://dx.doi.org/10.22159/ijap.2017v9i5.20847>]
- [13] Heyne K. *Useful plants Indonesia*. Jakarta: Sana Wana Jaya Foundation 1987; Vol. I: pp. 586-7.
- [14] Tarigan JB. Phytochemical screening of plants used by traders Jamu Gendong to maintain skin face in medan baru district. *Sumatra Biology* 2008.
- [15] Heinrich U, Moore CE, De Spirt S, Tronnier H, Stahl W. Green tea polyphenols provide photoprotection, increase microcirculation, and modulate skin properties of women. *J Nutr* 2011; 141(6): 1202-8. [<http://dx.doi.org/10.3945/jn.110.136465>] [PMID: 21525260]
- [16] OyetakinWhite P, Tribout H, Baron E. Protective mechanisms of green tea polyphenols in skin. *Oxid Med Cell Longev* 2012; 2012560682 [<http://dx.doi.org/10.1155/2012/560682>] [PMID: 22792414]
- [17] Graham HN. Green tea composition, consumption, and polyphenol chemistry. *Prev Med* 1992; 21(3): 334-50. [[http://dx.doi.org/10.1016/0091-7435\(92\)90041-F](http://dx.doi.org/10.1016/0091-7435(92)90041-F)] [PMID: 1614995]
- [18] Smith KR, Thiboutot DM. Thematic review series: Skin lipids. Sebaceous gland lipids: Friend or foe? *J Lipid Res* 2008; 49(2): 271-81. [<http://dx.doi.org/10.1194/jlr.R700015-JLR200>] [PMID: 17975220]
- [19] Mahmood T, Akhtar N, Moldovan C. A comparison of the effects of topical green tea and lotus on facial sebum control in healthy humans. *Hippokratia* 2013; 17(1): 64-7. [PMID: 23935347]
- [20] Gorle AM, Patil SS. Evaluation of antioxidant and antiacne property of *Rubia cordifolia*. *Pharm Sin* 2010; 1(3): 59-63.
- [21] Jain A, Basal E. Inhibition of Propionibacterium acnes-induced mediators of inflammation by Indian herbs. *Phytomedicine* 2003; 10(1): 34-8. [<http://dx.doi.org/10.1078/094471103321648638>] [PMID: 12622461]
- [22] Khan N, Karodi R, Siddiqui A, Thube S, Rub R. Development of anti-acne gel formulation of anthraquinones rich fraction from *Rubia cordifolia* (Rubiaceae). *Int J Appl Res Nat Prod* 2012; 4: 28-36.
- [23] Antarkar DS, Chinwalla T, Bhatt N. Anti-inflammatory activity of *Rubia cordifolia* Linn. in rats. *Indian J Pharmacol* 1983; 15: 185-8.
- [24] Tripathi YB, Sharma M, Shukla S, Tripathi P, Thyagaraju K, Reddanna P. *Rubia cordifolia* inhibits potato lipoxygenase. *Indian J Exp Biol* 1995; 33: 109-12.
- [25] Hutter JA, Salman M, Stavinoha WB, *et al*. Antiinflammatory C-glucosyl chromone from *Aloe barbadensis*. *J Nat Prod* 1996; 59(5): 541-3. [<http://dx.doi.org/10.1021/np9601519>] [PMID: 8778246]
- [26] Chithra P, Sajithlal GB, Chandrakasan G. Influence of Aloe vera on collagen characteristics in healing dermal wounds in rats. *Mol Cell Biochem* 1998; 181(1-2): 71-6. [<http://dx.doi.org/10.1023/A:1006813510959>] [PMID: 9562243]
- [27] Heggers JP, Kucukcelebi A, Listengarten D, *et al*. Beneficial effect of Aloe on wound healing in an excisional wound model. *J Altern Complement Med* 1996; 2(2): 271-7. [<http://dx.doi.org/10.1089/acm.1996.2.271>] [PMID: 9395659]
- [28] Burdock GA, Carabin IG. Safety assessment of sandalwood oil (*Santalum album* L.). *Food Chem Toxicol* 2008; 46(2): 421-32. [<http://dx.doi.org/10.1016/j.fct.2007.09.092>] [PMID: 17980948]
- [29] Christenson PA, Secord N, Willis BJ. Identification of trans- $\beta$ -santalol and epi-cis- $\beta$ -santalol in East Indian sandalwood oil. *Phytochemistry* 1981; 20: 1139-41. [[http://dx.doi.org/10.1016/0031-9422\(81\)83047-6](http://dx.doi.org/10.1016/0031-9422(81)83047-6)]
- [30] Deng S, May BH, Zhang AL, Lu C, Xue CC. Topical herbal medicine combined with pharmacotherapy for psoriasis: A systematic review and meta-analysis. *Arch Dermatol Res* 2013; 305(3): 179-89. [<http://dx.doi.org/10.1007/s00403-013-1316-y>] [PMID: 23354931]
- [31] Dubois Declercq S, Pouliot R. Promising new treatments for psoriasis. *ScientificWorldJournal* 2013; 2013980419 [<http://dx.doi.org/10.1155/2013/980419>] [PMID: 23935446]
- [32] Alok S, Jain SK, Verma A, Kumar M, Mahor A, Sabharwal M. Herbal antioxidant in clinical practice: a review. *Asian Pac J Trop Biomed* 2014; 4(1): 78-84. [[http://dx.doi.org/10.1016/S2221-1691\(14\)60213-6](http://dx.doi.org/10.1016/S2221-1691(14)60213-6)] [PMID: 24144136]
- [33] Dragland S, Senoo H, Wake K, Holte K, Blomhoff R. Several culinary and medicinal herbs are important sources of dietary antioxidants. *J Nutr* 2003; 133(5): 1286-90. [<http://dx.doi.org/10.1093/jn/133.5.1286>] [PMID: 12730411]
- [34] Niwano Y, Saito K, Yoshizaki F, Kohno M, Ozawa T. Extensive screening for herbal extracts with potent antioxidant properties. *J Clin Biochem Nutr* 2011; 48(1): 78-84. [<http://dx.doi.org/10.3164/jcfn.11-013FR>] [PMID: 21297917]
- [35] Adhikari S, Indira Priyadarsini K, Mukherjee T. Physico-chemical studies on the evaluation of the antioxidant activity of herbal extracts and active principles of some Indian medicinal plants. *J Clin Biochem Nutr* 2007; 40(3): 174-83. [<http://dx.doi.org/10.3164/jcfn.40.174>] [PMID: 18398494]
- [36] Bhandari PR, Kamdod MA. *Emblica officinalis* (Amla): A review of potential therapeutic applications. *Int J Green Pharm* 2012; 6: 257-69. [<http://dx.doi.org/10.4103/0973-8258.108204>]
- [37] Poltanov EA, Shikov AN, Dorman HJ, *et al*. Chemical and antioxidant evaluation of Indian gooseberry (*Emblica officinalis* Gaertn., syn. *Phyllanthus emblica* L.) supplements. *Phytother Res* 2009; 23(9):

- 1309-15.  
[http://dx.doi.org/10.1002/ptr.2775] [PMID: 19172666]
- [38] del Baño MJ, Lorente J, Castillo J, *et al.* Flavonoid distribution during the development of leaves, flowers, stems, and roots of *Rosmarinus officinalis*. postulation of a biosynthetic pathway. *J Agric Food Chem* 2004; 52(16): 4987-92.  
[http://dx.doi.org/10.1021/jf040078p] [PMID: 15291464]
- [39] Gao M. *et al.* The use of rosemary extract in combination with resin to extend the shelf life of pompano (*Trachinotus ovatus*) fillet during chilled storage. *Food Control* 2014; 37: 1-8.  
[http://dx.doi.org/10.1016/j.foodcont.2013.09.010]
- [40] Olmedo RH, Nepote V, Grosso NR. Preservation of sensory and chemical properties in flavoured cheese prepared with cream cheese base using oregano and rosemary essential oils. *Lebensm Wiss Technol* 2013; 53: 409-17.  
[http://dx.doi.org/10.1016/j.lwt.2013.04.007]
- [41] Aslam MN, Lansky EP, Varani J. Pomegranate as a cosmeceutical source: pomegranate fractions promote proliferation and procollagen synthesis and inhibit matrix metalloproteinase-1 production in human skin cells. *J Ethnopharmacol* 2006; 103(3): 311-8.  
[http://dx.doi.org/10.1016/j.jep.2005.07.027] [PMID: 16221534]
- [42] Bae JY, Lim SS, Kim SJ, *et al.* Bog blueberry anthocyanins alleviate photoaging in ultraviolet-B irradiation-induced human dermal fibroblasts. *Mol Nutr Food Res* 2009; 53(6): 726-38.  
[http://dx.doi.org/10.1002/mnfr.200800245] [PMID: 19199288]
- [43] MacLeod AJ, Pieris NM. Volatile components of papaya (*Carica papaya* L.) with particular reference to glucosinolate products. *J Agric Food Chem* 1983; 31: 1005-8.  
[http://dx.doi.org/10.1021/jf00119a021]
- [44] Flath RA, Light DM, Jang EB, Mon TR, John JO. Headspace examination of volatile emissions from ripening papaya (*Carica papaya* L., Solo variety). *J Agric Food Chem* 1990; 38: 1060-3.  
[http://dx.doi.org/10.1021/jf00094a032]
- [45] Karina A. *et al.* Evaluation of volatiles from ripening papaya (*Carica papaya* L., var. Maradol roja). *Food Chem* 2004; 86: 127-30.  
[http://dx.doi.org/10.1016/j.foodchem.2003.09.039]
- [46] Claudia L. Nutritional aspects of fruit and vegetable consumption. *Ciheam-Options Mediterranean*. 1992; pp. 79-87.
- [47] George M. *The World's Healthiest Foods*. The George Mateljan Foundation. Griere M A Modern Herb. Tigers Books International London 2001; 1: 239-41.
- [48] Griere MA. *Modern Herb*. Tigers Books International London 1992; 1(1): 239-41.
- [49] James SW, James BC. *Encyclopedia of pharmaceutical technology*. 2004.
- [50] Kapoor LD. *CRC Handbook of Ayurvedic Medicinal Plants* Boca Raton. FL: CRC Press 1990.
- [51] Katiyar SK, Ahmad N, Mukhtar H. Green tea and skin. *Arch Dermatol* 2000; 136(8): 989-94.  
[http://dx.doi.org/10.1001/archderm.136.8.989] [PMID: 10926734]
- [52] Gediya SK, Mistry RB, Patel UK, Blessy M, Jain HN. Herbal plants: Used as cosmetics. *J Nat Prod Plant Resource* 2011; 1: 24-32.
- [53] Jain A, Dubey S, Gupta A, Kannoja P, Tomar V. Potential of herbs as cosmeceuticals. *IJRAP* 2010; 1: 71-7.
- [54] Dixit SN, Srivastava HS, Tripathi RD. Lawsone, The antifungal antibiotic from leaves of *Lawsonia inermis* and some aspects of its mode of action. *Indian Phytopathol* 1980; 31: 131-3.
- [55] Korać RR, Khambholja KM. Potential of herbs in skin protection from ultraviolet radiation. *Pharmacogn Rev* 2011; 5(10): 164-73.  
[http://dx.doi.org/10.4103/0973-7847.91114] [PMID: 22279374]
- [56] Moyal D, Fourtanier A. Acute and chronic effects of UV on skin: What are they and how to study them? *Photoaging*. New York: Marcel Dekker Inc 2004; pp. 15-32.
- [57] Mithal BM, Saha RN. *A Handbook of Cosmetics*. New Delhi: Vallabh Prakashan 2006.
- [58] Vimaladevi M. *Textbook of Cosmetics*. 1st ed. New Delhi: CBS Publishers and Distributors 2005.
- [59] Bensouilah J, Buck P, Tisserand R, Avis A. *Aromadermatology: Aromatherapy in the Treatment and Care of Common Skin Conditions*. Abingdon: Radcliffe Publishing Ltd 2006.
- [60] Dweck AC. FLS FRSC FRSPH – Technical Editor. *Colour cosmetics: Comprehensive focus on natural dyes*. *Pers Care* 2009; 2(3): 57-69.
- [61] Greenhalgh DG. The role of growth factors in wound healing. *J Trauma* 1996; 41(1): 159-67.  
[http://dx.doi.org/10.1097/00005373-199607000-00029] [PMID: 8676414]
- [62] Steed DL. Modifying the wound healing response with exogenous growth factors. *Clin Plast Surg* 1998; 25(3): 397-405.  
[PMID: 9696900]
- [63] Williams RL, Armstrong DG. Wound healing. New modalities for a new millennium. *Clin Podiatr Med Surg* 1998; 15(1): 117-28.  
[PMID: 9463773]
- [64] Vogt PM, Lehnhardt M, Wagner D, Jansen V, Krieg M, Steinau HU. Determination of endogenous growth factors in human wound fluid: temporal presence and profiles of secretion. *Plast Reconstr Surg* 1998; 102(1): 117-23.  
[http://dx.doi.org/10.1097/00006534-199807000-00018] [PMID: 9655416]
- [65] Raya KB. *et al.* Changes in phytochemical contents in different parts of *Clinacanthus nutans* (Burm. f.) Lindau due to storage duration. *Bragantia* 2015; 74: 445-52.  
[http://dx.doi.org/10.1590/1678-4499.0469]
- [66] Raya KB. *et al.* Changes in phytochemical contents in different parts of *Clinacanthus nutans* (Burm. f.) Lindau due to storage duration. *Bragantia* 2015; 74: 445-52.  
[http://dx.doi.org/10.1590/1678-4499.0469]
- [67] Roeslan MO, Ayudhya TDN, Kootongkaew S. Characteristics of *Clinacanthus nutans* extraction from Thailand and Indonesia (preliminary study). *Sci-Health* 2012.
- [68] Bakht J, Tayyab M, Ali H, Islam A, Shafi M. Effect of different solvent extracted samples of *Allium sativum* on bacteria and fungi. *Afri. J Biotechnol* 2015; 10: 5910-5.
- [69] Bakht J, Islam A, Tayyab M, Ali H, Shafi M. Antimicrobial potentials of *Eclipta alba* by disc diffusion method. *Afri. J Biotechnol* 2011; 10: 7668-74.
- [70] Bakht J. *et al.* Antimicrobial activities of different solvents extracted samples of *Linum usitatissimum* by disc diffusion. *Afr J Biotechnol* 2011; 10: 19825-35.
- [71] Bakht J, Islam A, Shafi M. Antimicrobial potential of *Eclipta alba* by well diffusion method. *Pak J Bot* 2011; 43: 161-6.