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*Review Article*

# Skin Lightening and Dark Spot Treatment with Indigenous Arabian Phytochemicals: A Review of Evidence for Natural Skin Care Products Formulation

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## Abstract

The Arabian region has been a trailblazer in the use of plants and herbs for skincare, a practice that has been around for centuries. Indigenous plants and herbs have historically played significant roles in various skincare routines in Arabian culture, for both treatment as well as aesthetic purposes. The aim of this narrative review was to explore the traditional plant and herb-based methods used by Arabian people to treat dark spots and lighten the skin for aesthetic purposes and compare the presumed functions of these plants and herbs to the scientifically verified functions of the same plants and herbs. Literature search was conducted following which a list of plants and herbs traditionally used by Arabian people to treat various skin issues was retrieved. The scientific names of these plants and herbs were searched for, with which the functions of the identified plants were ascertained via the European Commission Cosmetic Ingredients (CosIng) database. Findings revealed that most of the plants and herbs reported to be used for traditional dark spot treatment, skin lightening and other skin care uses were confirmed to have active skin care functions. Majority of the plants and herbs that have been traditionally utilized for skincare by Arabian people possess one form or another of useful phytochemicals that can be applied in a wide variety of skincare improvement routines and the treatment of a myriad of skin conditions today. Although not necessarily skin lightening, important skin lightening adjunct functions include the roles of skin conditioning, tonic and astringent. While further scientific research is recommended to ascertain their mechanisms of action and efficacy, the integration of traditional knowledge with contemporary dermatologic research may unveil novel insights into the formulation of depigmenting or brightening skincare products that could also benefit a broader population.

**Keywords:** Skincare; Phytochemicals; Skin Lightening; Herbs

## Introduction

Since ancient times, herbs and indigenous plants have been a prominent feature in Arabian culture and used in a variety of skincare applications to play either aesthetic or medicinal roles [1]. It has already been established that in ancient Egypt, alabaster, animal oils and sour milk which contains lactic acid (an alpha-hydroxy acid) were applied to the skin to improve its aesthetic appearance [2]. Tribal women in Pakistan's Azad Kashmir in District Poonch, utilized indigenous plants to treat skin problems including acne (16%), facial spots (9%), allergy, (9%), fairness (8%), wrinkles (8%) and eye and lip care (9%) [3]. More recently, a study conducted among Jordanian women revealed that 60.7% of the participants currently use skin-lightening products [4].

Due to its long and rich history associated with the use of natural products to provide skincare solutions, practices which are still maintained to date, Arab regions can serve as an ideal source to seek organic skin lightening and dark spot treatment solutions. The compounds derived from the herbs and plants can then be included in the formulas of organic skincare products as ingredients or applied as standalone solutions for hyperpigmentation. In addition, the region has an abundant supply of

traditional herbs and plants, currently estimated at around 129 species, some of which have been demonstrated to possess properties that can treat a variety of ailments, of which about 40 target skin conditions [5].

Skin-lightening agents target melanin production and may also control other mechanisms in the skin pigmentation pathway [6]. The past few decades in the beauty and wellness industry has witnessed changes such as increasing awareness and safety of skin care products, with consumers tending to avoid products presumably made from synthetic additives and allegedly "harmful chemicals" and showing preference for skincare products with gentler and safer organic ingredients. This shift can also be attributed to increasing levels of awareness facilitated by easy access to readily available skin health information. The sourcing of organic ingredients in skincare products is also highly regulated and required to meet stringent standards, which means, the practices involved are sustainable and hence cause no harm to the environment, which is yet another attraction to organic skincare products.

Based on this background, it is vital to establish if the indigenous skincare routines adopted in Arabian culture to lighten skin and eliminate hyperpigmentation, can still be effective and relevant in the modern age. Achieving this goal can be helpful in identifying an organic skincare alternative to address skin lightening and the treatment of dark spots.

**Objectives**

The aim of this narrative review was to explore indigenous plant and herb-based substances traditionally used by Arabians treat dark spots and lighten/brighten the skin for aesthetic purposes and to establish if the traditional perceptions about the properties of the plants and herbs in question align with available scientific evidence.

**Methodology**

Electronic databases were searched for existing literature on herbs and plants to identify and draw up a comprehensive list of Arabian herbs, plants and other organic compounds that are traditionally used to lighten skin and eradicate dark spots. The botanical names of the plants and herbs were compiled and their scientifically proven functions were ascertained via the European Commission Cosmetic Ingredients (CosIng) database.

**Findings and Discussion**

Studies conducted over the years have demonstrated how some of these phytochemicals found in Arabian plants and herbs have played significant roles in traditional skin care activities [5-7]. A significant number of plants and herbs were being traditionally applied to the skin for aesthetic and treatment purposes. Table 1 below is a list of the plants and herbs, their botanical names and traditional skin care uses as reported by Said, et al., and Azaizeh, et al., in their ethnopharmacological survey of medicinal herbs in, as well as the scientifically proven functions of the plants and herbs in the list as indicated in the CosIng database [5,8,9].

| Plant/Herb | Arabic Name | Botanical Name | Traditional Application | Scientific (Evidence-Based) Function |
|---|---|---|---|---|
| African fleabane | نبات البراغيث الأفريقي | *Coniza bonariensis* | Cleansing, anti-microbial and moisturization | Anti-ageing, healing and irritant soother |
| Aloe vera | الصبار | *Aloe barbadensis* | Dark spot treatment; skin lightening | Skin conditioning |
| Annual/French mercury | عشبة الجارات | *Mercurialis annua* | Skin diseases | Tonic |
| Arabian jasmine (flower water) | ماء زهرة الياسمين العربي | *Jasminum sambac* | Soothing, skin brightening | Skin conditioning, perfuming |
| Argan oil | زيت عضوي | *Argania spinosa* | Moisturizing, anti-inflammatory, dark spot treatment | Skin conditioning, emollient |
| Arugula (leaf/seed extract) | جر جير | *Eruca sativa* | Skin disease and hair loss | Skin conditioning |
| Basil (leaf extract) | رَيحان | *Ocimum basilicum* | Soothing, anti-inflammatory | Skin conditioning, tonic |

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|---|---|---|---|---|
| Bay laurel | غار، راند | *Laurus nobilis* | Skin disease and cancer | Skin conditioning |
| Black nightshade | الثهلب زعتر حمير | *Solanum nigrum* | Skin diseases | Skin conditioning |
| Black seed oil | سوداء | *Nigella sativa* | Skin diseases | Skin conditioning |
| Bull mallow | الخطمي الثور | *Malva nicaeensis* | Skin soothing, regeneration agent | Moisturizer, anti-ageing |
| Cactus extract | مستخلص الصبار | *Cactaceae* | Hydrating, soothing, dark spot treatment | Antioxidant, astringent, skin conditioning |
| Calotrope | كالوتروب | *Malva nicaeensis* | Skin soothing, regeneration agent | Moisturizer, anti-ageing |
| Carrot seed oil | زيت بذور الجزر | *Daucus carota subsp. sativus* | Skin brightening | Skin conditioning |
| Castor bean oil | خروع | *Ricinus communis* | Skin diseases | Skin conditioning |
| Chamomile | البابونج | *Matricaria chamomilla* | Wound healing | Anti-inflammatory, moisturizer, treating wounds, skin conditions, hyperpigmentation |
| Common wheat | كميه | *Triticum aestivum* | Skin diseases | Skin conditioning, antioxidant |
| Cucumber (fruit water/fruit extract) | ثمرة خيار | *Cucumis sativus* | Skin brightening, dark spot treatment | Skin conditioning |
| Cumin (seed powder) | مسحوق بذور الكمون | *Cuminum cyminum* | Skin lightening, dark spot treatment | Skin conditioning |
| Date palm (fruit) | النخلة | *Phoenix dactylifera* | Skin lightening | Skin conditioning, emollient |
| Date palm (seed) powder | النخلة | *Phoenix dactylifera* | Skin lightening | Exfoliating |
| European tea tree | شجرة الشاي الأوروبية | *Lycium europaeum* | Wound treatment, skin soothing | Anti-inflammatory |
| Fenugreek (seed extract, sprout juice, fruit extract) | نبات الحلبة | *Trigonella foenum-graecum* | Skin brightening, dark spot treatment | Skin conditioning |
| Fig (fruit extract) | فاكهة التين | *Ficus carica* | | Humectant |
| Fig scrubs (leaf/seed) | فرك التين | *Ficus carica* | Exfoliating, skin brightening | Skin conditioning |
| Flax seed and flower extract | بذور الكتان | *Linum sativum* | Skin diseases, acne and burns | Skin conditioning, perfuming |
| Frankincense (gum/resin extract) | البخور | *Boswellia sacra* | Anti-inflammatory, skin lightening | Skin conditioning |
| Fringed rue | فيجن | *Ruta chalepensis* | Skin diseases | Skin conditioning, skin protecting |
| Grape seed extract | مستخلص بذور العنب | *Vitis vinifera* | Skin brightening, dark spot treatment | Anti-seborrhoeic, antimicrobial, antioxidant, skin protecting, UV absorber |
| Haldi (wild turmeric) root water/oil | هالدي | *Curcuma aromatica* | Anti-inflammatory, skin brightening, dark spot treatment | Skin conditioning, emollient, humectant |
| Harmala (Syrian rue) seed extract | حرمل، حرمليان | *Peganum harmala* | Skin diseases, wounds | Hair conditioning |

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| Henna (leaf extract) | الحناء | *Lawsonia inermis* | Dark spot treatment | Skin conditioning |
| Juniper berry | العرعر بيري | *Juniperus communis* | Antioxidant, dark spot treatment | Fragrance, astringent |
| Lavender (flower or extract) | خزامه | *Lavandula officinalis Chaix and Kitt* | Skin diseases | Antimicrobial, antisebum, skin conditioning, skin protecting, |
| Lemon and citrus extracts | ليمون | *Citrus limon* | Skin lightening | Tonic |
| Liquorice root (extract) | عرق السوس | *Glycyrrhiza glabra* | Skin brightening, dark spot treatment | Skin bleaching, skin conditioning, emollient, smoothing, soothing |
| Lupine (wild) | ترمس الجبل | *Lupinus varius Gaertn* | Skin diseases (hyperpigmentation) | Skin conditioning |
| Mint | نعناع | *Mentha* | Astringent, skin brightening | Skin conditioning |
| Mitnan (shaggy sparrow wort) leaf extract | ميتنان | *Thymelaea hirsuta* | Skin diseases | Skin conditioning |
| Myrtle (extract) | مستخلص الآس | *Myrtus communis* | Astringent, skin brightening | Astringent |
| Neem (seed/leaf/barkoil/) extract | النيم | *Azadirachta indica* | Antibacterial, anti-inflammatory, dark spot treatment | Skin conditioning |
| Olive (oil) | زيت الزيتون | *Olea Europaea Fruit Oil* | Antioxidant, dark spot treatment | Skin conditioning, fragrance |
| Orange blossom water | ماء زهر البرتقال | *Citrus aurantium amara* | Astringent, skin brightening | Skin conditioning, tonic |
| Palestine oak | بلوط | *Quercus calliprinos* | Skin diseases | Not defined |
| Papaya | بابايا | *Carica papaya* | Exfoliating, skin brightening | Skin conditioning |
| Peony (bark/sap extract) | مستخلص لحاء الفاوانيا | *Paeonia lactiflora* | Skin brightening, dark spot treatment | Tonic |
| Peony root extract | جذر الفاوانيا يستخرج | *Paeonia lactiflora* | Dark spot treatment and skin lightening<br>Anti-aging, skin regeneration | Skin conditioning |
| Prickly alkanet | لسان الثور | *Anchusa trigosa* | Treatment of burns, wounds, anti-inflammatory | Anti-microbial, antioxidant, skin revitalization |
| Rapeseed oil, seed extract | لفت | *Brassica napus* | Acne treatment | Skin conditioning, emollient |
| Red lentil (fruit extract) | مستخلص أوراق العدس الأحمر | *Lens culinaris* | Exfoliating, skin brightening | Skin protecting |
| Red lentil (seed extract) | مستخلص بذور العدس الأحمر | *Lens culinaris* | Skin lightening, dark spot treatment | Antimicrobial, anti-sebum |
| Robert's geranium/herb-Robert (root extract) | ابر ة الراعي | *Geranium robertianum* | Skin problem and acne | Astringent, tonic |
| Rose bay/rose laurel | دفلت | *Nerium oleander* | Skin diseases | Skin conditioning |

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| Rosewater | ماء الورد | *Rosa damascena (flower water)* | Astringent, skin lightening | Antioxidant, astringent |
| Saffron (whole plant) | زعفران | *Crocus sativus* | Skin lightening | Anti-oxidant, skin conditioning |
| Salad burnet | عشبة الجراح | *Sanguisorba minor* | Skin diseases, burns, wounds | Antioxidant, skin conditioning |
| Sandalwood powder | خشب الصندل | *Santalum album* | Skin brightening | Skin conditioning |
| Savory/whitweed | زوفا | *Micromeria myrtifolia* | Skin diseases | Skin conditioning |
| Squill | بصل الفار | *Urginea maritima* | Skin diseases | Deodorant, fragrance |
| Squirting cucumber | فقوس حمار | *Ecballium elaterium* | Skin disease | Skin conditioning |
| St. John's wort | حلاو ه | *Hypericum perforatum* | Skin disease | Antimicrobial, astringent, skin conditioning, skin protecting, soothing, tonic |
| Sweet almond seed powder | اللوز الحلو | *Prunus Amygdalus Dulcis* | Skin lightening | Exfoliating |
| Sweet violet | البنفسجي الحلو | *Viola odorata* | Skin diseases | Skin conditioning, fragrance |
| Sycamore fig (leaf extract) | جميز | *Ficus sycomorus* | Skin disease | Fragrance, skin protecting |
| Tumeric (Rhizome) | كُركُم | *Curcuma longa* | Skin lightening | Skin conditioning |
| Walnut flower extract | زهرة الجوز | *Juglans regia* | Exfoliating, skin brightening | Skin conditioning |
| Walnut scrub (leaf extract) | فرك الجوز | *Juglans regia* | Exfoliation, skin brightening | Abrasive, astringent, skin conditioning, cleansing, soothing |
| Whit/savory weed | عشبة لذيذة | *Micromeria myrtifolia* | Anti-inflammatory, treatment for stings, bites | Antioxidant, anti-microbial |
| White horehound | الزعتر الأبيض | *Marrubium vulgare* | Treatment for skin jaundice, damage | Soothing, skin conditioning |
| Wild carrot (leaf/root) | جزر بسثاني | *Daucus carota* | Treatment of skin problems and acne | Skin conditioning, Miscellaneous |

**Table 1:** Indigenous plants and herbs used in traditional Arabian skin care practices.

Herb and plant-derived active substances are usually perceived as milder, safer and healthier than synthetic products for improving skin lightness and treating skin hyperpigmentation [10]. Not all the examined plants and herbs possessed skin lightening ability, however, all the plants reviewed possessed different types of compounds that are beneficial for skin care. Evidence from CosIng, confirmed only licorice extract to possess direct skin bleaching properties [9]. Findings from a study, however, demonstrated *Paeonia lactiflora* root extract and paeoniflorin to have shown potential as skin whitening agents in cosmetic applications, with potential benefits for brown and dark pigmented spots [11]. Although not necessarily skin-lightening/brightening, important adjunct functions possessed by the other listed plants and herbs included skin conditioning, tonic, exfoliation, moisturizing, astringent and protection, all of which are known to indirectly support or enhance the skin lightening/brightening process [9].

Plants used in the Arabian region for skin care are potential sustainable sources of phytochemicals that can aid in the lightening of dark spots on the skin as most of the plants and herbs reported to be used for traditional dark spot treatment, skin lightening/brightening and other skin care uses were confirmed to have one or more active skincare related [8]. Bioactive

phytochemical compounds with skin lightening or depigmentation properties can be grouped into major classes namely flavonoids, phenolic acids and alkaloids. Flavinoids are found in plants like frankincense and saffron. The flavonoids contained in frankincense, in combination with boswellic acids were found to reverse hyperpigmentation, which may sometimes be caused by oxidative stress, and also reduce skin inflammation levels considerably [12]. The active compounds in saffron, crocin and kaempferol, have the capacity to reduce oxidative damage and impede tyrosinase, an important enzyme that plays a role in controlling melanin production. This process invariably results in skin brightening [13].

Phenolic acids can be found in fruits like pomegranate, licorice, apples, grapes, strawberry and tea leaves among others. Pomegranate has a rich concentration of ellagic acid, a known melanin inhibitor, which also prevents skin from developing dark spots which may be caused by exposure to UV rays among others [14,15]. The active compound in licorice is glabridin, a powerful inhibitor of tyrosinase which interferes with the synthesis of melanin in order to lighten the skin [16]. Alkaloid active substances are found in henna and black seed oil, among others. Henna is an integral feature of Arabian culture and has been traditionally used for skin and hair care, attributable to lawsone (hennotannic acid), an alkaloid component [17]. The phytochemical thymoquinone contained in black seed oil acts as an antioxidant and anti-inflammatory agent and can reduce a variety of skin blemishes, including dark spots [18].

Apart from flavonoids, phenolic acids and alkaloids, a host of other plants and herbs found in the Arabian region contain other bioactive compounds that indirectly play important supportive roles that enhance skin lightening and dark spot treatment. For example, essential oils obtained from myrrh have regenerative and anti-microbial qualities help to improve skin tone. Similarly, rosewater, contains polyphenols and vitamin C (ascorbic acid), both of which combat hyperpigmentation [19].

**Mechanism of Skin Lightening and Depigmentation by Phytochemicals**

Certain skin diseases, like acne, trigger the inflammatory pathway and this leads to increased melanin deposits on the affected areas, darkening the skin even more. Mechanisms through which skin lightening occurs involve tyrosinase inhibition, and antioxidant and anti-inflammatory processes. Some phytochemicals present in the indigenous Arabian plants and herbs, like kaempferol from saffron and glabridin in licorice, inhibit the process whereby the enzyme tyrosinase converts tyrosine to dopaquinone, for example, thus mitigating the resulting hyperpigmentation or dark spots [20]. Another factor that triggers melanin production by melanocytes is exposure to the sun's ultraviolet (UV) rays and this results in darkening of the skin. Antioxidant agents in the indigenous plants and herbs like phenolic acids in pomegranate and thymoquinone in black seed oil have been demonstrated to eradicate free radicals, possibly resulting in the reduction or halting of the triggered production of melanin. Finally, active compounds in the indigenous plants and herbs, like glabridin in licorice and boswellic acids found in frankincense, play roles in countering the melanin production process thus mitigating pigmentation, and ensuring a brighter and even skin tone [9,21].

**Natural vs. Synthetic Dark Spots and Skin Lightening Treatment**

There is an increasing demand in the cosmetic industry for ethically sourced and environmentally friendly ingredients to be used in beauty products. The phytochemicals found in indigenous plants and herbs in the Arabian region apparently provide some of the best options capable of catering to this clamor for skincare that is 100% organic based. This is because, in comparison to the synthetic ingredients used in commercial skincare products to treat dark spots and lighten skin, the natural compounds in Arabian plants offer a solution that is considered or perceived by consumers as cleaner and gentler on the skin [22].

The two most common synthetic agents used in commercial skincare products to lighten skin and treat hyperpigmentation are hydroquinone and retinoids. Although they tend to be quite effective, they have been linked to side effects and other adverse health risks. Hydroquinone causes the skin to develop sensitivity to UV light, skin discoloration (ochronosis), and/or acute inflammatory reaction while retinoids can result in photosensitivity, excessive skin dryness, peeling and cell damage [23]. However, the likelihood of natural compounds like ellagic acid or glabridin causing adverse skin reactions are significantly lower, thus making phytochemicals ideal for long-term use. Another advantage of compounds derived organically from indigenous plants is that they provide multiple skin benefits, such as skin firming by frankincense and inti-inflammatory effects from black seed oil, in addition to treating dark spots [24].

**Limitations of the use of phytochemicals in skincare**

- Inconsistent efficacy: Active substances extracted from the indigenous plants and herbs can have disparities in potency, depending on a myriad of factors ranging from prevailing weather conditions during plant growth and timing of harvest, to the extraction techniques applied. The use of synthetic versions of the ingredients, with standardized amounts of active portions usually solves this problem [25].
- Exposure to the elements: Phytochemicals tend to be highly sensitive to a variety of elements like water, heat, air and light, all of which can result in the degradation of active compounds. Prolonged exposure to these elements can result in degradation, thereby shortening the shelf-life of products formulated with the phytochemicals in question [26]
- Skin absorption rates: Absorption of organic active substances into the skin might be challenging on account of their unique molecular structures. Synthetic versions of the actives can be chemically designed to overcome this challenge [27]

**Conclusion**

Indigenous plants and herbs used by Arabians for skin care have actual and adjunct skin lightening and dark spot treatment benefits. With ongoing clamour for natural and/or clean beauty, the plants and herbs might have significant roles in the formulation of natural cosmetic and personal care products for dark spots treatment and skin lightening, for use by Arabians. While further scientific research is recommended to ascertain the mechanisms of action, efficacy and safety of the plants and herbs, the integration of traditional knowledge with contemporary dermatologic research may unveil novel insights into the formulation of depigmenting skincare products that could benefit Arabians as well as a broader population.

**Conflicts of Interest**

The authors declare no conflict of interest in this paper.

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