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NIGELLA SATIVA SEED, A NOVEL BEAUTY CARE INGREDIENT: A REVIEW

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ABSTRACT: *Nigella sativa* seed is one of the spices, which is referred by Prophet Mohammed as a herb of blessing, which can cure everything other than death. Therapeutic potential of *Nigella sativa* seed has been very well studied by many researchers, but its use in cosmetic science is not very well studied. *Nigella sativa* seed is intensively studied for its chemical composition. It is reported to contains Thymoquinone, Nigellimine-N-oxide, Nigellicine, Nigellidine, Nigellone, Dithymoquinone, Thymohydroquinone, Thymol, Arvacrol, 6-methoxy-coumarin, 7-hydroxy-coumarin, Oxy-coumarin, Alpha-hedrin, Steryl-glucoside, Tannins, Flavinoids, Essential fatty acids, Essential amino acids, Ascorbic acid, Iron and calcium. Presence of these natural actives makes *Nigella sativa* seed as great medicinal herb. *Nigella sativa* seed has antimicrobial, antioxidant, anti-aging, hair growth promoter, sun protection, anti cancer activity, which make it a novel ingredient for many cosmetic preparations. This review brings the comprehensive compilation of researches on *Nigella sativa* seed in the area of cosmetics and related fields.

INTRODUCTION: Since the beginning of human civilization, humans are known to use cosmetics, made out of natural materials like herbs, minerals and animal substances for impressing and attracting others [1]. In modern days, cosmetics have started turning to be one of the basic needs of human beings. Modern cosmetic business is almost 400 billion dollars per annum worldwide. Cosmetic business has gone through series of transformation. In earlier days, cosmetics used to be crude natural products in the form of fresh crushed leaves, roots, seeds and extracts of plant parts.

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After this era, there was a gradual change in formats of cosmetics, it became more attractive and convenient to use, but the dependence on processed, synthetic and chemical based actives has greatly increased. Daily newer and better actives are getting invented across the globe, which are making cosmetics more efficacious. Many such synthetic chemicals used as actives in cosmetic products pose health and safety risk on human health.

As per the International regulations, cosmetic should be safe with practically no undesirable effects. Safety of cosmetic preparation is most important as cosmetics are used for longer period of time than medicines. Recently, there have been lots of reports and alerts on serious undesirable effects of cosmetics [2]. The Scientific Committee on Cosmetic Products and Non food products of

European Commission provides an opinion on safety of each ingredient under use in cosmetics. Recently certain chemical ingredients like hair dyes[3], preservatives [4, 5] and fragrance ingredients [6] are restricted and banned by the Scientific Committee on Cosmetic Products and Non food products (SCCP) basis the reported toxic ,carcinogenic, allergenic effects. With increased consumer awareness, now consumers are moving towards more natural, no or less chemical based cosmetics.

The reason for this is the effective, soft and perceived no undesirable effect nature of natural/herbal cosmetics. Cosmetics with natural/herbal actives from particular geographies like *Azadirachta indica* (Neem) from India, *Argania spinosa* (Argan) seed Oil from Morocco, *Olea europaea* (Olive) seed oil from Spain are quite popular. These geographical origin claims have also got their place in marketing of cosmetics. This is because natural ingredients of particular origin showed better efficacy value as compared to ingredient of same species originating from other geographies. This may be due to suitable enriching environment for these herbs in a particular geography. Relation between geographical origin of natural ingredients with their composition and efficacy could be another very interesting subject of study. Natural products of cosmetic values are present in bark, leaf, flower, root, fruit and seed hence they can be used in raw crushed forms as paste, juices and powder. In many cases extracts and oils of plant parts are found to be very effective. Many herbs are reported to be very effective in healing scars, improving skin complexion, perfuming of body, cleansing and miniaturisation of skin etc.

Cosmetics can be broadly classified as rinse off and leave on cosmetics. Rinse off products are shampoo, conditioners, soaps, hand wash, etc. while leave on cosmetics are hair cream, hair lotion, hair oil, hair gel, mascara, lipstick, lip gel, nail polish, deodorant, body spray. Toothpaste, mouth wash, intimate wash are also considered as cosmetics.

There is a surge in use of herbs in cosmetics like herbal face wash, herbal conditioner, herbal soap, herbal shampoo, and many more. Cosmetics with herbal connotation are perceived as safe as compared to cosmetic made out of processed and synthetic chemical material [1]. Following is the list of herbal ingredients used in cosmetics.

TABLE 1: HERBAL INGREDIENTS IN COSMETICS [7]

Botanical Name and Part Used	Common Name	Form	Use
Acacia concinna pods	Shikakai	Powder	Shampoo, Soap
Acorus calamus rhizome	Sweet Flag	Powder/Paste	Aromatic, Dusting Powders, Skin Lotions
Allium sativum bulbs	Garlic	Powder/ Paste	Promotes Skin healing
Alpinia galanga rhizome	Galanga	Powder/Paste	Aromatic, In dusting Powders
Avena sativa fruit	Oat	Powder / Paste	Skin tonic / Moisturizer
Azadirachta indica leaves	Neem	Powder / Paste	Tooth Pastes, Soaps, Shampoo
Balsamodendron myrrha gum	Myrrh	Powder/Paste	Soaps , Shampoo
Calendula officinalis flowers	Marigold	Paste	Promotes skin care
Cedrus deodara wood	Deodar	Powder/Paste	Shampoo, Soaps
Centella asiatica plant	Gotu Kola	Powder/Paste	Wound Healing
Cichorium intybus seed	Chicory	Powder/Paste	Relieves sore eyes,Clears Skin of blemishes
Citrus aurantium peel	Orange	Paste	Skin cream, Soap, Shampoo
Citrus lemon peel	Lemon	Powder	Heals skin, Prevents Hair Loss
Coriandrum sativum seed	Coriander	Powder	Anti-inflammatory
Crocus sativus stigma	Saffron	Liquid	Post bath massage
Curcuma longa rhizome	Turmeric	Powder/Paste	Skin cream, Skin lotion Antibacterial
Curcuma zedoaria rhizome	Zedoary	Powder/Paste	Antibacterial, Aromatic
Daucus carota seed	Carrot	Oil	Natural source of Vitamin A
Eclipta alba plant	Bhringraj	Powder/Paste	Shampoo
Glycyrrhiza glabra root	Liquorice	Powder/Paste	Anti-inflammatory
Hedychium spicatum rhizome	Kapurkachir	Oil	Hair Oils

Hibiscus rosa sinensis flowers	China rose	Paste	Shampoo
Iris florentina root	Orris	Powder	Additive to dusting Powder
Lawsonia alba leaves	Heena	Powder/Paste	Shampoo, Hair colour
Matricaria chamomilla flowers	Chamomile	Powder/Paste	Hair Tonic, Relieves sore Limbs
Moringa oleifera seed	Benjamin	Oil	Hair Oils, Suntan Lotion
Prunus serotina bark	Wild cherry bark	Powder	Shampoo
Pterocarpus santalinus bark	Red sandal wood	Powder/Paste	Skin cream
Rubia cordifolia root	Manjistha	Powder/Paste	Wound Healing
Santalum album wood	Sandal Wood	Powder/Paste	Skin Lotion's
Sapindus trifoliatus fruit cortex	Soap wort	Powder	Natural Detergent

If we review the above list, we can easily notice that there are many plants which are commonly used as spices and foods also used as cosmetic ingredients. Plants like *Citrus aurantium* (Orange) peel, *Citrus lemon* (Lemon) peel, *Coriandrum sativum* (Coriander) seed, *Crocus sativus* (Saffron) stigma, *Curcuma longa* (Turmeric) rhizome are extensively used in beauty products [8, 1]. *Nigella sativa* seed is one amongst the favorite spice in Middle East, Asia and Europe.

Its utility as medicinal herb is very well known, but its potential as cosmetic ingredient is still little known. In this article, we are attempting to review the use of *Nigella sativa* seed for various cosmetic applications, so that cosmetics scientists can use *Nigella sativa* seed as an active ingredient for developing new cosmetic products, which are efficacious and safe.

Nigella sativa Plant:

Occurrence:

Nigella sativa plant is an annual herbaceous plant of family Ranunculaceae, it is abundantly grown in the Middle east, Eastern Europe, Western Asia.

Synonyms:

English: Fennel flower Black cumins, Love-in-a-mist., nutmeg flower, Roman coriander

Arabic: Habatut Barakah Shooneez, Habba Sauda, Habb al-barka

Sankrit: Krishana – Jiraka, Upakunchika

German: Schwarzkümmel

Chinese: Pei hei zhong cao
French: Cheveux de Vénus, Nigelle

Hindi: Kalonji.

Marathi: Kalonji Jire

Persian Name: Siah Dana

Punjabi Name: Kalvanji

Urdu Name: Kalonji

All though above are common synonyms referred, there is a lot of confusion about the name of *Nigella sativa* seed. In many regions like Central Asia and Northern India, seed is called black cumin, black caraway and black onion seed but there is no botanical relation between *Nigella sativa* seed and seed of any of these kind. Many time these resembling seed forms part of commercially available stock and used as adulterants.

Morphology:

Nigella sativa herb grows to 20–25 cm tall, with finely divided, linear leaves. Leaves are divided into linear segments 2 to 3 cm long. Leaves are opposite in pairs on either side of the stem. Upper leaves are long as compared to lower leaves, they are petiolate and flowers grow terminally on its branches. The flowers are colored pale blue and white, with 5 to 10 petals and are quite delicate. The fruit is a large inflated capsule composed of three to seven united follicles. Seeds are black, triangular in shape, 2 to 3 mm long. Fruit has pungent odor when crushed, contains good amount of fixed and essential oil.

Till date there are 21 different species of black seed reported [9]. But *Nigella sativa* is the most studied species, followed by *Nigella damascene* and *Nigella arvensis*. Identification of various species of black seed is quite difficult and hence use of DNA bar coding has been proposed to differentiating various species and varieties.

FIG. 1 : FLOWERS OF *NIGELLA SATIVA* [10]

FIG. 2: FRUIT OF *NIGELLA SATIVA* [11]

FIG.3 : BROKEN FRUIT WITH *NIGELLA SATIVA* SEED [12]

FIG. 4 : SEED OF *NIGELLA SATIVA*

Cultivation and collection:

Nigella sativa plant is an annual herb cultivated mostly during the winter season. It is cultivated on heavy and light soil. Period of sowing is October to November and harvesting is April to May. Its yield is approximately 300kg/acre to 400 kg/acre.

Seeds are sown in upper soil as germination, get delayed if sown deep inside. It does not need frequent irrigation. The crop is harvested when the fruit/capsule turn yellowish. After harvesting and proper drying, it can be threshed by trampling with a tractor or proper thresher. After threshing, the seeds are properly stored in bags or containers [13].

Chemical composition:

Nigella sativa seed is extensively studied herbal medicine by many researchers. They have reported the discovery of many active principles like Thymoquinone, Nigellimine-N-oxide, Nigellicine, Nigellidine, Nigellone, Dithymoquinone, Thymohydroquinone, Thymol, Arvacrol, 6-methoxy-coumarin, 7-hydroxy-coumarin, Oxy-coumarin, Alpha-hedrin, Steryl-glucoside, Tannins, Flavinoids, Essential fatty acids, Essential amino acids, Ascorbic acid, Iron and calcium [14, 15, 16, 17, 18].

Rich contents of natural products provide profound therapeutic value to *Nigella sativa* seeds and its derivative. In many studies, *Nigella sativa* seeds has proved to be anti-inflammatory, analgesic, anti-histaminic, anti-allergic, anti-cancer, anti-oxidant, immune stimulant, anti-hypertensive, anti-asthmatic, hypoglycemic, anti-bacterial, anti-viral, anti-fungal and anti-parasitic [14, 15, 16, 17, 18,19].

Nigella sativa seed found to be contents variety of chemicals [20], these chemicals are significantly therapeutic in nature.

- 32-40% of fixed oil (consists of unsaturated fatty acids like Linoleic, Linolenic, Arachidonic, Eicosadienoic, Oleic acid, Almitoleic acid, Palmitic acid, Stearic and Myristic acid, Beta-sitosterol, Cycloartenol, Cycloeucalenol, Sterol esters and Sterol glucosides).

- 0.4-0.45% of volatile oils (Consists of Nigellone, Thymoquinone, Thymo hydroquinone, Dithymoquinone, Thymol, Carvacrol, α & β-pinene, d-limonene, d-

citronellol, p-cymene and 2-(2-methoxypropyl)-5-methyl-1,4-benzenediol).

- 16-19.9% of protein consists of amino acids like Arginine, Glutamic acid, Leucine, Lysine, Methionine, Tyrosine, Proline and Threonine
- Carbohydrates (33.9%) Fiber (5.5 %), Water (6 %)
- Alkaloids like Nigellicine, Nigellidine, Nigellimine-N-oxide.
- Coumarins consists of 6-methoxy-coumarin, 7-hydroxy-coumarin, 7-oxy-coumarin.
- Saponins consists of Alpha-Hedrin, Steryl-glucosides, Acetyl-steryl-glucoside.
- Minerals like Calcium, phosphorous, potassium, sodium and iron.

CHEMICAL STRUCTURE OF KEY ACTIVES REPORTED IN *NIGELLA SATIVA* OIL [21]

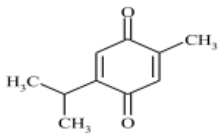

FIG.5 :THYMOQUINONE

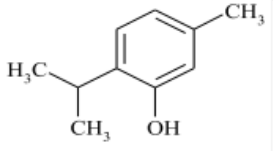

FIG. 6 : THYMOL

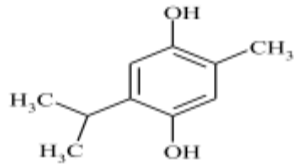

FIG.7: THYMOHYDROQUINONE

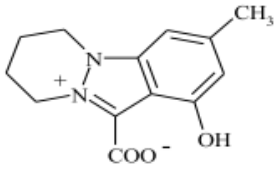

FIG. 8 : NIGELLICINE

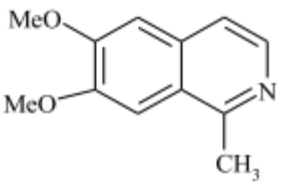

FIG. 9 : NIGELLIMINE

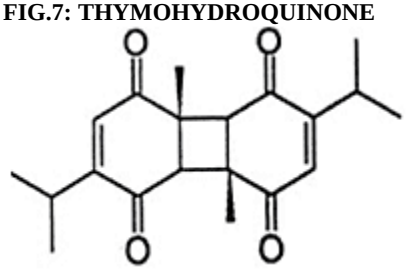

FIG. 10 : DITHYMOQUINONE

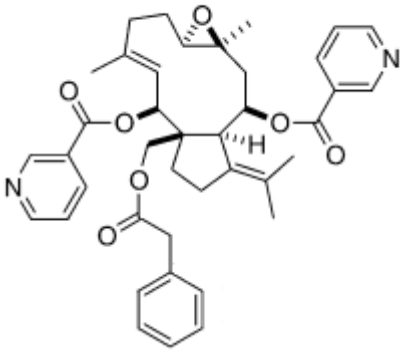

FIG.11 : NIGELLAMINE

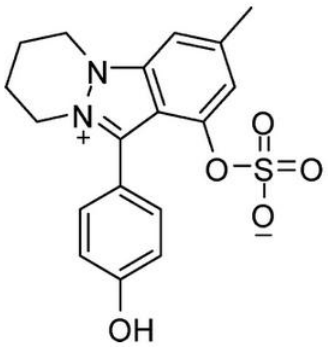

FIG. 12 : NIGELLIDONE-4-SULPHATE

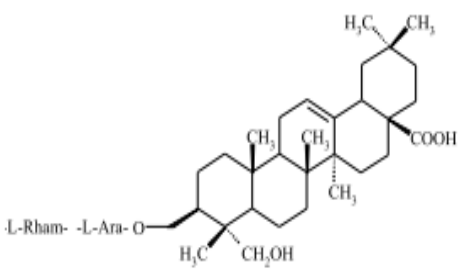

FIG.13 : ALPHA HEDERIN

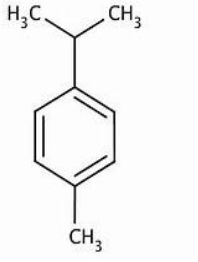

FIG. 14 : p-CYMENE

Toxicological profile:

In various studies, *Nigella sativa* seed and its constituents are found to be quite safe.

In a study *Nigella sativa* seed oil was given orally to mice for 90 days to check chronic toxicity. It is observed that there are no changes in key hepatic enzyme levels like alanine-aminotranferase, aspartate-aminotransferase, and gammaglutamyl-transferase. Histological study showed that there was no change observed in the tissues of heart, liver, kidneys and pancreas. LD_{50} values of *Nigella sativa* oil were observed to be 26.2-31.6 and 1.86-2.26 respectively when administered in single dose orally and intraperitoneally in mice. This key hepatic enzyme stability and organ integrity directly demonstrate low toxicity with wide margin of safety of therapeutic dosage of *Nigella sativa* oil 21. In another toxicological study after intra-peritoneal injection and oral ingestion showed LD50 for Thymoquinone to be 104.7 mg/kg (89.7 to 104.7) and 870.9 mg/kg (647.1-109.8) respectively. LD50 in rats was found to be 57.5 mg/kg (45.6-69.4) and 794.3 mg/kg (469.8-1 118.8) after intra-peritoneal injection and oral ingestion respectively. It shows that the LD50 values reported for *Nigella sativa* seed Oil and actives like Thymoquinone after intra-peritoneal injection and oral administration are 10-15 times and 100-150 times greater than doses of Thymoquinone reported for its anti-oxidant, anti-inflammatory, and anti-cancer effects.

In a study, acute and chronic toxicity of *Nigella sativa* actives (Seed Oil and Thymoquinone) were studied on laboratory animals, where practically no or non significant toxicity was observed , hence *Nigella sativa* seed and its derivative can be considered as safe, particularly when given orally [22, 23, 24, 25].

Cosmoceutical Potential:

Nigella sativa seed has been referred as 'Habba Al Sauda' or 'Habba Al Barakah' in Arabic literatures. Abu Huraira narrated that Prophet Muhammad said "Use the black seed, which is a healing for all diseases except As-Sam(Death)" [26].

Above belief triggered lots of studies on *Nigella sativa* seed in the area of therapeutics.

Its medicinal properties provide *Nigella sativa* seed the status of best candidate as medicinal and cosmetic ingredient.

Antibacterial:

In a clinical study to check the antibacterial property of *Nigella sativa* seed extract, 40 neonates infected with pustules staphylococcal skin infections were treated with *Nigella sativa* seed extract (33%) and it was found that *Nigella sativa* seed extract is as effective as standard drug Mupirocin [27].

In few studies *Nigella sativa* seed was found to be more effective on Gram +ve bacteria than Gram –ve bacteria [28 - 30].

Antibacterial property of *Nigella sativa* seed is due to the presence of actives like Thymoquinone, Thymohydroquinone and Thymol. It is observed that these actives showed considerable antibacterial activity against Gram +ve bacteria as compared to Gram –ve bacteria species. Only one out of 13 strains of *S.epidermidis* tested for inhibition was observed to be not sensitive to *Nigella sativa* seed Oil.

Nigella sativa seed oil was found to be effective against 17 strains out of 18 strain of coagulase negative *Staphylococci* which to be resistant to a number of antibiotics. Importantly *Nigella sativa* seed oil could inhibit *Streptococcus pyogenes*, which was resistant strain to Erythromycin. *Nigella sativa* seed oil was also found active against multidrug resistant strains of *Streptococcus aureus* and *Pseudomonas aeruginosa* [29].

*Streptococcus mutan*s and *Streptococcus mitis are responsible for human* dental caries and bad breath odor. In a study where two *Nigella sativa* extracts were evaluated for in-vitro antibacterial activity against *Streptococcus mutan*s and *Streptococcus mitis* using agar well diffusion method, it is observed that ethanolic extract showed highest zone of inhibition (12.7mm and 10.4mm) against *Streptcocus mutans* and *Streptococus mitis* respectively, while the inhibition zone of ether extract was found to be 6.3mm and 5.1mm against *Streptcocus mutans & Streptococus mitis* respectively [30].

In a study where antibacterial activity of aqueous infusions and aqueous decoctions of three seed like kalonji (*Nigella sativa*, Ranunculaceae), cumin (*Cuminum cyminum*, Umbelliferae) and poppy seed (*Papaver somniferum*, Papaveraceae) were investigated against 188 oral bacterial isolates belonging to 11 different genera of Gram +ve and Gram -ve microorganisms using disc diffusion method. Decoction of cumin showed highest antibacterial potential, with inhibition of 73% of the tested microorganisms, followed by aqueous decoctions of *Nigella sativa* seed with inhibition of 51% of the tested microorganisms and poppy seed was found to be inhibiting only 14.4% of tested microorganism [31].

Imam Ibn Qayyim Al-Jauziyah in his book Medicine of the Prophet mentioned the use of black seed for improving oral health when used with vinegar [32].

Robert W. Lebling and Donna Pepperdine MH in a book 'Natural Remedies of Arabia' mentioned the use of *Nigella sativa* seed powder decoction as gargle for control of toothache, tonsil and larynx pain [33].

Antifungal:

Diethyl ether extract of *Nigella sativa* seed observed to be effective against *Candida albicans* [34]. In animal study, growths of *Candida* yeasts in several organs were inhibited by the ether extract of *Nigella sativa* [35]. *In vitro* study showed that Thymoquinone can inhibit the growth of *Aspergillus niger* and *Fusarium solani*, this activity was comparable to amphotericin-B [36]. Growth Inhibitory activity of Thymoquinone was reported to be more efficient than Amphotericin-B and Griseofulvin against *Scopulariopsis brevicaulis* in vitro. There was 100% inhibition of the growth of *S. brevicaulis* with Thymoquinone 1 mg/ml, while Amphotericin-B 1 mg/ml inhibited only 70% growth [30]. The ether extract of *Nigella sativa* was found to inhibit dermatophytes isolated from sheepskin infection [37].

In a study Fluconazole susceptible and resistant *Candida albicans* infections in mice were treated with various doses of Fluconazole (0, 5, 10, 20 and 40mg/kg), free Thymoquinone (TQ) and Liposomal TQ (0, 1, 2 and 5 mg/kg) for 40 days. Free Thymoquinone showed its activity against both Fluconazole susceptible and resistant *Candida albicans*, but Liposomal TQ was showed best antifungal activity, which had imparted ~100% and ~90% survival of mice infected with Fluconazole susceptible and resistant *Candida albicans* respectively [38].

Hair loss:

Robert W. Lebling and Donna Pepperdine MH [21] in the book Natural Remedies of Arabia mentioned the use of *Nigella sativa* seed powder along with Arugula juice, Olive oil, Vinegar in Saudi Arabia for hair fall control [33].

Telogen effluvium is a condition where thinning or shedding of hair occurs due to early entry of hair in the telogen phase. In the study *Nigella sativa* seed, which has Thymoquinone (TQ) as a primary active and has anti-oxidant and anti-inflammatory effects by inhibiting pro-inflammatory mediators, such as cyclooxygenase and prostaglandin D2 was used. 20 patients affected by Telogen effluvium were selected for the double-blind, placebo-controlled and randomized study. 10 of these patients were treated with a lotion containing 0.5% *Nigella sativa*, daily for three months, while the other ten patients were treated with placebo daily for three months. Assessment of improvement was done using video dermatoscopic analysis (Trichoscan Dermoscopy Fotofinder®) and examination by three independent dermatologists, before treatment (T0), after three months of treatment (T3) and at the six months follow-up (T6).

Significant improvement in 70% patients treated with *Nigella Sativa* was observed. A Significant increment of hair density and hair thickness was seen in Videodermatoscopic analysis in patients treated with *Nigella sativa*. It was also observed that *Nigella sativa* reduced the inflammation in the majority of patients affected by Telogen effluvium[39].

In a clinical study where hair oil containing Kala Jera oil (*Nigella sativa*), Narkal oil (*Cocos nucifera*), Amloki (*Emblica officinalis*), Henna (*Lawsonia alba*), *Durba Ghas* (*Cynodon dactylon*), Mathi (*Trigonella foenumgraecum*) was studied for

its hair fall control activity in 90 patient. It was found that hair falls reduced to 76%, 72%, 67%, 59%, 32%, 0% on 15 days, 30 days, 45 days, 60 days, 75days and 90days by using this experimental herbal hair oil over purified coconut oil [40].

Skin infections:

Robert W. Lebling and Donna Pepperdine MH in the book Natural Remedies of Arabia mentioned the use of *Nigella sativa* seed powder and honey mix for acne treatment and clear facial [33].

Imam Ibn Qayyim Al-Jauziyah in his book Medicine of the Prophet mentioned the use of black seed burnt mixed with waxes along with henna or its oil for treatment of skin ulcers. It is also mentioned that *Nigella sativa* seed, when mixed with vinegar had been in use for dandruff and ailments like leprosy and black pigmentation [32].

Vitiligo is one of the autoimmune skin diseases which destroy the melanocytes of the skin, resulting white patches on the skin. A study was conducted, where the efficacy of *Nigella sativa* seed and fish oil were tested against vitiligo lesions of the patients. The study medications with *Nigella sativa* seed oil were applied two times a day by patients on their lesions. The improvement in lesions was checked by the Vitiligo Area Scoring Index (VASI). Application of *Nigella sativa* seed oil proved to be useful as the mean score of VASI decreased from 4.98 to 3.75 in patients, while VASI decreased from 4.98 to 4.62 in the case of those using topical fish oil. *Nigella sativa* seed oil found to be more efficient regarding percent improvement observed in the area of head, neck, upper extremities. There was no adverse effect reported by the patients. *Nigella sativa* seed oil seed was found more efficient in comparison to the fish oil [41].

Antipsoriatic activity of ethanolic extract of *Nigella sativa* seed was evaluated by using mouse tail model and in vitro antipsoriatic activity by SRB Assay using HaCaT human keratinocyte cell lines. The experimental ethanolic extract of *Nigella sativa* seed created a quite significant epidermal differentiation, from its degree of orthokeratosis (71.36□+/-2.64) when compared to the negative control (17.30+/-4.09%). This effect can be compared with tazarotene (0.1%) gel (the standard positive control), which showed a (90.03□+/-2.00%) degree of orthokeratosis. The ethanolic extract of *Nigella sativa* seed found to have better antiproliferant activity with IC50 239 µg/ml, when compared with Asiaticoside with IC50 value of 20.13µg/ml [42].

Nigella sativa seed and its oil are found to be very effective in promoting wound healing in farm animals [43]. In animal testing, *staphylococcal* skin infection in mice was treated with *Nigella sativa* seed and its oil, found to enhance healing by reducing total and absolute differential WBC counts, bacterial expansion and tissue impairment, local infection and inflammation [44].

In a clinical study, where *Nigella sativa* oil lotion 10% was applied for two months, mean lesion count of papules and pustules was found to be reduced significantly.

In the test group, the response to treatment was graded as good in 58%, moderate in 35% and no response in 7%. The satisfaction of patients with treatment was found to be full in 67%, partial in 28%, and no satisfaction in 5%. While in the control group, the lesions showed no significant reduction after two months and the response to treatment was good in 8%, moderate in 34%, and no response in 58%. The satisfaction of patients with treatment in this group was full in 8%, partial in 24%, and no satisfaction in 68%. During the study, there were no side effects reported in the group treated with *Nigella sativa* oil lotion 10%. The researcher attributed the results to the antimicrobial, immunomodulatory and anti-inflammatory effects of *Nigella sativa* oil [45].

The molecular mechanisms of anti-inflammatory and antioxidative activities of thymoquinone had been studied. When pretreatment of female HR-1 hairless mouse skin was done with thymoquinone, it attenuated 12-O-tetradecanoylphorbol-13-acetate (TPA)-induced expression of cyclooxygenase-2 (COX-2). Thymoquinone diminished nuclear translocation and the DNA binding of nuclear factor-kappa-B (NF-jB) via the blockade of phosphorylation and subsequent degradation of IjBa in TPA-treated mouse skin. Thymoquinone

also attenuated the phosphorylation of Akt, c-Jun-N-terminal kinase, and p38mitogen-activated protein kinase, but not that of extracellular signal-regulated kinase-1/2. Moreover, topical application of thymoquinone-induced the expression of hemeoxygenase - 1, NAD(P)H - quinone oxido reductase - 1, glutathione – S - transferase and glutamate cysteine ligase in mouse skin [46].

In vivo and *ex vivo* study where emulsion of seedcake extracts of *Nigella sativa* have been evaluated using a pH meter, corneometer, tewameter, methyl nicotinate model of micro-inflammation in human skin and tape stripping of the stratum corneum found to reduce skin irritation and improved the skin hydration and epidermal barrier function as compared with placebo. The basis which the researchers suggested the potential use of an emulsion of seedcake extracts of *Nigella sativa* in anti-aging, moisturizing cosmetics [47].

In randomized controlled double-blinded clinical trial, new cases of hand eczema in 18-60 years of age in three therapeutic groups (*Nigella sativa*, Betamethasone and Eucerin) were asked to apply medications twice a day and for 4-week period, which resulted in changes in severity and improved life quality, this was assessed at the interval of 0^{th} day, 14^{th} and 28^{th} days of the study by Hand Eczema Severity index (HECSI) and Dermatology Life Quality Index (DLQI) respectively. *Nigella sativa* and Betamethasone showed significantly more rapid improvement in cases of hand eczema as compared with Eucerin ($P = 0.003$ and $P = 0.012$ respectively). *Nigella sativa* and Betamethasone ointments caused significant decreases in DLQI scores compared with Eucerin ($P < 0.0001$ and $P = 0.007$ respectively). There was no significant difference observed in mean DLQI and HECSI of the *Nigella sativa* and Betamethasone groups over time ($P = 0.38$ and $P = 0.99$ respectively), which showed that *Nigella sativa* might have the same efficacy as Betamethasone in the improvement of life quality and decreasing the severity of hand eczema [48].

Sun Protection:

In a study, cream with 0.5% *Nigella sativa* oil was tested for *in vitro* sun protection factor. It was observed that the formulation with 0.5% *Nigella sativa* oil is having SPF value of 1.05 with ultra boot star rating of 2. Rating of 2 is considered as having a real sunscreen activity [49].

Antioxidant Properties:

Antioxidant property of foods, herbal and dietary supplements play a critical role in prevention of degenerative diseases mainly cancers, cardiovascular and neurodegenerative diseases. The concentration of polyphenolic compounds is directly proportional to an antioxidant property of foods, herbal and dietary supplements.

In a study where essential oil of *Nigella sativa* seed was tested for a possible antioxidant activity using two TLC screening methods, showed that Thymoquinone, Carvacrol, t-anethole and 4-terpineol demonstrated respectable radical scavenging property. These four constituents and the essential oil possessed variable antioxidant activity when tested in the diphenyl picrylhydrazyl assay for a non-specific hydrogen atom or electron donating activity. They were also effective as hydroxyl radical scavenging agents in the assay for non-enzymatic lipid peroxidation in liposomes and the deoxyribose degradation assay [50].

Preservative Property:

Due to the antimicrobial activity of *Nigella sativa* seed, it was evaluated for its natural preservative property where Jordanian *Nigella sativa* seed was used as a preservative for safe storage of date pastes. In experiments, the post-processing development of contaminating microorganisms present in stored date pastes was controlled adequately with 100, 200, and 400 ppm of Jordanian *Nigella sativa*. Amongst this concentration 400 ppm was found to be preserving sensory quality attributes of dates, paste regarding color, flavor, texture and taste during four months of storage at room temperature. This was comparable with 400 ppm of sodium benzoate as preservatives [51].

The effect of *Nigella sativa* seed (1% and 3%) and oil (0.3% and 1%) were studied on some food poisoning, pathogenic bacteria and total bacterial count (CFU/g) in soft white cheese (prepared from raw ewe's milk and laboratory pasteurized ewe's

milk). The soft white cheese was inoculated with *Staphylococcus aureus*, *Brucella melitensis* and *Escherichia coli* at a concentration of 1×10^6 CFU/ml. Cheese samples were checked for the bacterial count at 0^{th}, 2^{nd}, 4^{th} and 6^{th} days of storage at refrigerator temp.

Results showed that there was significant decrease ($P<0.05$) in the total bacterial count, *Staphylococcus aureus*, *Brucella melitensis* and *Escherichia coli* count in cheese samples treated with *Nigella sativa* seed (1% and 3%) and oil (0.3% and 1%) with pronounced concentration dependent inhibition. In contrast, to control cheese samples which exerted significant increase in bacterial counts as it reached 2.8×10^7, 2.95×10^6, 2.22×10^6 and 2.885×10^6 CFU/g for the Total bacterial count, *Staphylococcus aureus*, *Brucella melitensis* and *Escherichia coli* respectively at the 6th day of storage at refrigerator temperature. *Nigella sativa* seed oil (0.3% and 1%) was significantly more efficient ($P<0.05$) as an antibacterial agent than seed (1% and 3%) respectively [52].

CONCLUSION: Although *Nigella sativa* seed is one of the most studied medicinal ingredients, it's potential as a cosmetic ingredient is still not very well explored, we hope this review would provide extensive insight towards the use of *Nigella sativa* in beauty preparations.

Looking at the rich composition of *Nigella sativa* seed, it is perceived that various extract and paste of *Nigella sativa* seed could act as novel ingredients in hair, skin and oral care cosmetics. *Nigella sativa* could be the best candidate for treating various fungal and bacterial infections like dandruff, acne, pimples and other skin conditions.

Its antioxidant properties make *Nigella sativa* oil as a best antiaging ingredient. Antiaging products are high in demand. Regarding its antimicrobial properties against many pathogenic bacteria, yeast and mold indicate that it can be used in handwash, soaps, shampoo, skin clarifying cream. In fact, till date USFDA has not approved any hair growth promoter, but looking at the impact *Nigella sativa* Oil on Telogen Effluvium, *Nigella sativa* oil can act as the best candidate for natural hair growth promoter.

Looking at active like Thymoquinone, which also provide sun protection, *Nigella sativa* oil can be developed as Sun protective active.

Its strong actions against cariogenic bacteria like *Streptococcus mutans*, *Streptococcus mitis*, and *Candid albicans* make *Nigella sativa* seed oil as best natural ingredients for mouthwash and toothpaste. *Nigella sativa* seed has enriched phenolic compound contents, which makes it perfect remedies against oral infections.

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