



Nigella Sativa Seed: A Cosmetic Herb

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Abstract

Natural ingredients have been used from ancient times for skincare purposes. Nowadays, they are becoming more common in formulations, due to consumers concerns about synthetic ingredients or chemical substances. The use of bioactive extracts from a variety of plant in cosmetics are for two purposes such as body care and also influence the biological functions of the skin, providing the nutrients for the healthy skin. Generally, plant extracts are a rich source of vitamins, antioxidants, essential oils, hydrocolloids, proteins, terpenoid, and other bioactive compounds. According to their composition, these extracts can provide different properties. *Nigella sativa* also called black cumin and kalonji is an annual flowering plant in the family *Ranunculaceae*. It contains many bioactive like thymoquinone, thymohydroquinone, dithymoquinone, thymol, etc. Along with pharmacological activities it also provides cosmetic activities like sun protection; anti-skin pigmentation, anti-inflammatory and antibacterial etc. Thymoquinone is the main constituent of *N.Sativa* seed responsible for antioxidant, anti-inflammatory properties. It can improve skin complexion, boost the production of melanin, help to decline in skin hyperpigmentation, and cure pimple by antibacterial property. *N.sativa* extract helps to brightening the skin. The current review highlights the potential use and benefits of *Nigella sativa* in cosmetic formulation.

Keywords- Bioactives, antibacterial, antimicrobial, hyperpigmentation, *Nigella sativa*, thymoquinone, skincare,

Introduction

The history of herbalism started to the dawn of human existence, which represents the world's civilization, the branches of herbalism reflect the culture from where they came. The practice of herbal skin treatment has very ancient origins. The history of cosmetic spans at least 6,000 years of human history. The ancient science of cosmetology have developed in India with the earliest reports of cosmetic substance and their application dating back to Circa 2500 and 1550 B.C to the Indus Valley civilization. Herbal cosmetics are the preparation containing bioactives from a variety of botanical sources, which provide nutrients required for healthy skin or hair. (1, 2)

Herbs and spices have been used by humans for centuries. Apart from their culinary recreational and aromatic value, many of them are used for cosmetic purposes. Cosmetic alone cannot take care of skin, the working of an active ingredient is highly required to fight against the damage and aging of the skin. Nowadays bioactive ingredients have become more popular in cosmetic preparation due to consumer concern about synthetic products which are enriched with a chemical substance. The main benefit of the addition of herbal extract into the skincare is, it provides antioxidant, anti-inflammatory, antiseptic, antimicrobial, etc. Plant extracts are also popular in clinical development because of their nontoxic nature on normal cell and their cytotoxic effects on cancer cells increased their demand. Natural product shows less toxicity than synthetic products (3). Adverse effects may occur in the form of skin irritation, eye irritation, phototoxicity, acute toxicity, photosensitization, skin sensitization, chronic toxicity, etc. by the synthetic products. Plant extract such as Turmeric, Neem, Lemon, Cinnamon, Black seed etc. are commonly used in skincare.

Nigella sativa L. belongs to the buttercup family *Ranunculaceae*. It is classified as a mild spice based on plant parts used. *Nigella sativa* is commonly known as 'black seed'. *N. sativa* seed and its oil have been widely used for centuries in the treatment of various ailments throughout the world and it is an important in the Indian traditional system of medicine like Unani and Ayurveda (4). It contains many bioactive constituents like thymoquinone, thymohydroquinone, dithymoquinone, thymol, carvacrol, nigellimine, nigellidine and alpha-hederin etc. *Nigella sativa* gives pharmacology and cosmetic properties both like antioxidant, antimicrobial, anti-inflammatory, astringent, stimulant, and diuretic, etc. (5, 6)

Synonyms of *Nigella sativa*

Black cumin, , Nutmeg Flower, Black seed, , Roman Coriander, Fennel Flower, Damascena, Devil in-the-bush, Black Caraway , Wild Onion Seed. (6)

Botanical description of *N. sativa* (6)

Kingdom- Plantae	Class- Magnoliopsida
Sub-kingdom- Tracheobionta	Order- Ranunculaceae
Superdivision- Spermatophyte	Genus- Nigella
Phylum - Magnoliophyta	Species- N. sativa

Geographical Source

N. sativa is cultivated in Punjab, Himachal Pradesh, Madhya Pradesh, Bihar, Jharkhand, Syria, Turkey, Saudi Arabia, Assam, West Bengal, and Andhra Pradesh. It is produced in an area of about 9000 ha area with a production of about 7000-8000 tonnes in India. It is native to southern Europe, North Africa, and southwest Asia. (7, 8)

Cultivation and harvesting

N. sativa is mostly grown once in a year as Rabi crop in India. It is harvested during March to 1st week of April and in hills in May- June. *N. sativa* grows well in a cool dry place area to warm humid area. Sandy, loam, and sloppy soil of heavy rainfall area and drained soil of moderate rainfall area are suitable for cultivation. Soil pH 7 to 7.5 is ideal for cultivation. *N. sativa* is harvested before shedding at the little green stage which gives high aromatic oil content. Two to three more pricking can be done to avoid loss of seed due to shattering of the capsule. The harvested crop is dried under sun and stored in an airtight container in a cool, dark place. (9)

Morphology of plant

N.sativa plant is an erect, herbaceous annual plant with height ranging from 30 to 60 cm. the flower is pale blue or white later, when young it is pale green and light blue when mature (fig.2). Flower of *N.sativa* is solitary, terminal long peduncle without an involucre. It has five sepals, petaloid, corolla absent, stamens numerous, five carpels, partially united. The leaves are cut into linear- lanceolate segment with 2-3 pinnatisect, greyish green in color, fine and feathery. The fruit is a capsule having many nectaries, pocket-like, epicalyx present. Macroscopically seed are rugulose-tubercular and trigonous and small dicotyledonous. Seed are small matt black grains and rough surface with an oily white interior. They roughly triangulate, 1.5-3 mm long .Seed are the same as onion seed and slightly bitter and peppery with a crunchy texture (Fig no.1).Microscopically, transverse section of seed shows single layered epidermis consisting of elliptical, thick walled cells, covered externally by a papillose cuticle and filled with dark brown contents.(7, 10)



Fig no. 2 Plant of *N.sativa* (11)



Fig no. 1 Seed of *N.sativa* (12)



Fig no. 3 Oil of *N.sativa* (13)

Chemical constituent of *N.Sativa seed*

The fixed oil (Fig no.3) (32-40 %) contains unsaturated fatty acids which include arachidonic, eicosadienoic, linoleic, linolenic, oleic, palmitoleic, palmitic, stearic and myristic acid as well as beta-sitosterol, cycloeucalenol, cycloartenol, sterol esters and sterol glycosides. The volatile oil (0.4-0.45 %) contains saturated fatty acids which includes nigellone that is the only component of the carbonyl fraction of the oil, Thymoquinone (TQ) (Fig no.4), thymohydroquinone (THQ), dithymoquinone, thymol, carvacrol, α and β -pinene, d-limonene, d-citronellol, *p*-cymene volatile oil of the seed also contains *p*-cymene, carvacrol, t-anethole, 4-terpineol and longifoline. *N.sativa* seed have two various forms of alkaloids: isoquinoline alkaloid that includes: nigellicimine, nigellicimine n-oxide and pyrazol alkaloid that includes nigellidine and nigellicine. The nutritional compositions of *N. sativa* are vitamins, carbohydrates, mineral elements, fats, and proteins that have eight or nine essential amino acids (Table no.1). *N.sativa* seeds also contain saponin, alpha hederine and also contains a trace amount of carvone, limonene, and citronellol, as well as provides relatively good amounts of various vitamins and minerals such as Fe, Ca, K, Zn, P, and Cu. (7, 14)

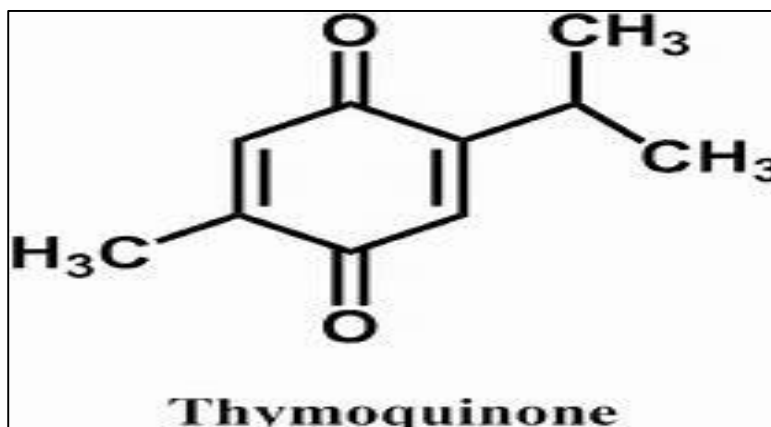


Fig no. 4 Thymoquinone (15)

Table no. 1 Chemical constituents of *N.sativa* seed (7, 14, 16)

Constituent	Concentration
Volatile oil	0.5%
Fatty oil	31%
Thymoquinone	5.53% in aqueous extract 0.33% in chloroform extract
Stearic acid	28.59%
Palmitic	7.3%
Linoleic	6.27%
Oleic acid	2.75%
Protein	16-19.9%
Carbohydrates	33.9%
Water	6%
Fibre	5.5%
Trans-anethole	38.3%
p-cymene	14.8%
Limonene	4.3%
Carvone	4%
Thymoquinone	0.6%
Six phenyl propanoid compound	46.1%
Nine monoterpenoid hydrocarbon	26.9%
Four monoterpenoid ketone	6%
Eight non terpenoid hydrocarbon	4%
Three mono terpenoid alcohol	2.7%
Two sesquiterpenoid hydrocarbon	1%

Pharmacological properties of *N.sativa* seed

It has been used for thousands of years as a spice and food preservatives. It is used in traditional medicine in the middle and far East for a wide range of disorders. It is a miracle herb with a rich historical and religious background, many researches revealed its wide spectrum of pharmacological potential. Several pharmacological properties of *N.sativa* include antitumor, antinociceptive, anti-inflammatory, antibacterial, antidiabetic, antiviral, antihelminthic, antimicrobial, antihistaminic, immunomodulative and hepatoprotective have been revealed. Antioxidant activity has also been reported. (14, 17)

Thymoquinone (Fig no.4) is a constituent of the volatile oil of *N.sativa* shows several pharmacological activities including antioxidant and anti-inflammatory activity. Anethole shows fungicidal, antioxidant, and anti-inflammatory activity. (14)

Antioxidant property

Oxidative damage initiated by reactive oxygen species (ROS) is a major contributor to skin aging. Free radicals generated internally within the skin cell during normal oxidative metabolism or by external sources such as UV irradiation cause skin aging. Skin exposure to ionizing and UV radiation generates ROS in excessive quantities that can deplete tissue antioxidants and other oxidants- degrading pathways. Uncontrolled release of ROS is involved in the pathogenesis of some human skin disorders, including premature skin aging. In addition to UV radiation, heme pathway intermediates may have pro-oxidant effects, whereas heme oxygenase, an enzyme that degrades heme, can function as both an antioxidant and a pro-oxidant. (8) Exposure of skin to UVA releases labile iron, leading to oxidative stress in the skin. antioxidant molecules slow the process of aging either by preventing free radicals from oxidizing sensitive biological molecules or by reducing the formation of free radicals and quenching the already formed ROS.

It has been reported that thymoquinone has antioxidant properties with different mechanism. Thymoquinone has been shown to have a radical scavenging effect on various oxygen species including superoxide radical's anion and hydroxyl radicals. (18)

Antifungal Property

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 showed the best antifungal activity, which had imparted ~100% and ~90% survival of mice infected with Fluconazole susceptible and resistant *Candida albicans* respectively. (18)

Antibacterial property

Antibacterial property of *N.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 *N. sativa* seed Oil. (19)

Cosmetic potential of *N.sativa* seed

It has been reported that Cleopatra used it as its health beauty giving quality. Queen Nefertiti used *N.sativa* oil to bring luster to her hair and nails. Black seeds are now used as skincare naturals. Some use it for healthy hair and nails and to restore good health. *N.sativa* is a wonderful oil to be used in a skin balm due to its healing, pain relief, and skin conditioning properties. *N.sativa seed* has antimicrobial, antioxidant, anti-aging, hair growth promoter, sun protection, etc. which make it a beneficial ingredient for

many cosmetic preparations. Its various extracts, oil, and paste of *Nigella sativa* seed can be used in hair, skin, and oral care cosmetics. Its antioxidant properties is known to promote the skin's elimination of harmful free radicals, thus diminishing the appearance of wrinkles, fine lines, dark spots, and other blemishes, thereby exhibiting a rejuvenating and revitalizing effect, which makes *Nigella sativa* oil as the best anti-aging ingredient, which can be used in anti-aging products. Antimicrobial properties against many pathogenic yeast, fungal, molds and bacteria like *Streptococcus mutans*, *Streptococcus mitis*, and *Candida albicans* make *Nigella sativa* seed oil as the best natural ingredients for mouthwash and toothpaste and also it could be the best constituent for treating various fungal and bacterial infections like dandruff, acne, pimples, and other skin conditions and can be used in antidandruff shampoo, anti-acne cream hand wash, and skin clarifying cream. *Nigella sativa* oil can act as the best candidate for natural hair growth promoter. *N. sativa* seeds could be used in cosmetics because of its aroma components. Sun protective factor (SPF) value for *N. sativa* seed oil is more than 2. Thymoquinone is the constituent responsible for its SPF and can be incorporated in sunscreen products. *Nigella sativa* seed has enriched phenolic compound contents, which makes it perfect remedies against oral infections. (19, 20).

Skin Pigmentation

N. sativa oil has shown effective treatment for different kinds of diseases such as vitiligo, which is a hypopigmentation disorder. A special study was conducted and it was noticed that *N. sativa* can spread melanin within the skin. The mechanism of this process was that it increased the intensity of melanin by increasing the sensitivity of cholinergic receptors inside the melanopsin, the external part of lizard. That study showed that using the active ingredient of *N. sativa* oil, thymoquinone, for skin pigmentation. (21)

Sun protection

N. sativa oil was tested for in vitro sun protection factor. It was observed that cream with 0.5% *N. sativa* oil having an SPF value of 1.05 with an ultra-boot star rating of 2. Rating 2 is considered as having real sunscreen activity. (21)

Hair loss

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 *N. sativa* seed, which has Thymoquinone (TQ) as a primary activity 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% *N. sativa*, daily for three months, while the other ten patients were treated with a placebo daily for three months. Assessment of improvement was done using video dermatoscopic analysis and examination by three independent dermatologists, before treatment, after three months of treatment, and at the six months follow-up. (19)

Wound healing

It was found that *N. sativa* oil has the ability on increasing collagen formation and increasing rate of epithelialization. Thus, it has a good effect on wound healing and moisturizing effect. A study conducted in 2004 used a monolayer prototype of human gingival fibroblast to test the wound healing properties of *N. sativa* extract. In this study an increase in the rate of proliferation was observed. Thus, according to the results and other researches done, it can be said that *N. sativa* could prove to be promising active in the treatment of wound. Thymoquinone is reported to prevent oxidative injury, act as an antioxidant, and prevent membrane lipid peroxidation in tissues. (22)

Acne vulgaris

Acne vulgaris is one of the most common human diseases, which is considered an infectious disease. Many researchers studied the effect of *N. sativa* oil against acne vulgaris. *Hadi and Ashor (2010)* reported that using 20% of *N. sativa* oil extract in lotion formulation has a good ability and is less toxic than benzoyl peroxide lotion 5%, which is the basic treatment for mild to middle stage of acne vulgaris. (23)

Using instruments such as pH meter, Corneometer, Tewameter, methyl nicotinate model of micro-inflammation in human skin, and tape stripping of the stratum corneum, the *in vivo* and *ex vivo* properties of emulsions with the seedcake extracts of *N. sativa* have been evaluated. Emulsions with *Borago officinalis*, and *N. sativa* seedcakes significantly reduced skin irritation and improved the skin hydration and epidermal barrier function as compared with placebo. The potential use of seedcakes is in anti-aging, moisturizing, mitigating, and protective cosmetics due to their antioxidant and anti-inflammatory activities. (24)

Toxicity of *N.sativa* seed

Many toxicological studies have been carried out on *Nigella sativa* seeds. No toxic effects were reported when *N.sativa* fixed oil was given to mice via the stomach in the study. But Higher content of linoleic acid and other unsaturated fatty acids in *N. sativa* oil are responsible for the enhancement of *in vitro* percutaneous absorption of the drug and Contact dermatitis developed after the application of ointment made from the *N. sativa* seed oil, but it could have been due to impurity in the black seed oil. Acute and chronic toxicity of *Nigella sativa* constituents (Seed Oil and Thymoquinone) were studied on laboratory animals, where practically no or non-significant toxicity was observed, hence *Nigella sativa* seed can be considered as safe. (18, 24, 25)

Conclusion

The world is inclined towards the use of herbal products and more natural way of life. The bioactives from a variety of herbs and spices are used in cosmetic for multiple functions. They provide pharmacological activities as well as cosmetic activities like antioxidant, antibacterial, anti-inflammatory, etc. N.Sativa provides cosmeceutical activities like sun protection, prevent skin pigmentation, anti-inflammatory and antibacterial, etc. Thymoquinone is the main constituent of N.Sativa seed which gives these cosmetic properties. It can improve skin complexion, boost the production of melanin, help to decline in skin pigmentation, and cure pimple by antibacterial property. The present review highlights the use of *Nigella sativa* for skin and hair benefits which help to formulate cosmetic products. Its different properties can be further explored in cosmetic industries to use in various cosmetic formulations.

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