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A REVIEW ON NIGELLA SATIVA: A BLACK SEED OF MIRACLE

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ABSTRACT

The medicinal herb *Nigella sativa* of the Ranunculaceae family is utilized extensively all over the world. It is widely used in several conventional medical systems, including Unani, Tibb, Ayurveda, and Siddha. Folklore has long used seeds and oil in a variety of food and medical systems. Numerous illnesses and disorders have been treated with *Nigella sativa* seeds in the past. The seed *Nigella sativa*, sometimes referred to as black caraway and "**Kalonji**," is well-known throughout the world. It is one of the most widely used medicinal plants in the world, and its fixed oil includes a variety of beneficial chemical compounds, including thymoquinone, thymohydroquinone, dithymoquinone, thymol, nigellicine, carvacrol, nigellimine, nigellicine, nigellidine, and alpha-hederin. Antioxidant, anti-inflammatory, antibacterial, antifungal, antiparasitic and antiprotozoal, antiviral, cytotoxic, anticancer, neuro-, gastro-, cardio-, hetapto-, and nephroprotective activities are just a few of the potential uses for *Nigella sativa* and its constituents, including some isolated compounds. This further reveals that the main bioactive component of the essential oil, thymoquinone, is responsible for the majority of the plant's medicinal capabilities. The pharmacological properties of *Nigella sativa* for the treatment of acne vulgaris, vitiligo, atopic dermatitis, plaque psoriasis, and wound healing are reviewed in this article based on the most recent research.

Keyword: Nigella Sativa , Black Seeds , Medicinal Plant , Anti-hypertension , Anti-oxidant , Anti-Inflammatory , Thymoquinone .

1. INTRODUCTION

As numerous studies have indicated, Nigella sativa (N. sativa) (Family Ranunculaceae) has a wide range of pharmacological potential and is emerging as a wonder herb with a rich historical and religious basis among diverse medicinal plants. Black seed is a common name for N. sativa. Native to Southern Europe, North Africa, and Southwest Asia, N. sativa is now grown in a variety of nations, including the Middle East Mediterranean region, Southern Europe, India, Pakistan, Syria, Turkey, and Saudi Arabia.[1]

More than 2000 years ago, N. sativa (NS) seeds and oil were used in traditional medicine, and Hippocrates and Discroides referred to the herb as "the Melanthion". [2]

An annual flowering plant, nigella sativa. The plant has linear lanceolate leaves and reaches a height of 20–30 cm (7.9–11.8 inches). The fragile flowers are typically yellow, white, pink, pastel blue, or pale violet in color, and they have 5 to 10 petals. The fruit of the plant is a big, inflated capsule that has three to seven joined follicles, each with many seeds. The oblong, flat, and angular black-colored seeds have funnel forms that are 0.2 cm long and 0.1 cm wide.[3]

A variety of active substances found in NS, including thymoquinone (TQ), alkaloids (nigellicines and nigelledine), saponins (alpha-hederin), flavonoids, proteins, fatty acids, and many more, have been

shown to be effective in the treatment of patients with a variety of disorders. [4,5] The majority of the herb's effects are linked to TQ, which is the most prevalent component in the volatile oil of NS seeds. Nigella sativa is a well-known and unique plant that has been utilized extensively across various civilizations for many millennia [6, 7]. The seeds of a plant locally known as "Kalonji" have been employed in traditional and alternative medicine for the treatment of a number of ailments, including diarrhea and asthma [8,9,10].

Nigella sativa seeds have a variety of medicinal properties, including antioxidant, anti-inflammatory, immunomodulatory, anticancer, neuroprotective, antimicrobial, antihypertensive, cardioprotective, antidiabetic, gastroprotective, and nephroprotective and hepatoprotective properties, which are largely responsible for these traditional uses [11].

2.Taxonomic Classification

Kingdom	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyta
Phylum	Magnoliophyta
Class	Magnoliopsida
Order	Ranunculales
Family	Ranunculaceae
Genus	Nigella
Species	N. sativa (12)

3. Common names

Black cumin, Fennel Flower, Nutmeg Flower, Black seed, Black Caraway, Roman Coriander, Damascena, Devil in-the-bush, Wild Onion Seed (13)

Nigella sativa flower(14)

Nigella sativa seeds (14)

4. Morphology of the plant

Plant morphology the annual blooming plant N. sativa has finely split leaves and reaches a height of 20 to 90 cm. Its blooms have five to ten petals and come in white, yellow, pink, pale blue, or pale purple colors. A big, inflated capsule made up of three to seven joined follicles, each bearing multiple seeds, makes up the fruit . Small, dicotyledonous, trigonous, angular, tubercular seeds with a slightly aromatic scent and a bitter taste . They are black on the outside and white within.

5. Chemical composition of black seeds

Unsaturated fatty acids, primarily linoleic acid (50–60%), oleic acid (20%), eicosadienoic acid (3%) and dihomolinoleic acid (10%), are found to be present in high concentrations in the seeds' fatty oil. About 30% or less of them are saturated fatty acids (palmitic and stearic acid). In the Tunisian and Iranian kinds of black seed oils, respectively, -sitosterol makes up 44% and 54% of all sterols, whereas stigmasterol makes up the remaining 6.57 to 20.92%. [14][15]

Various black seed kinds have produced a number of active chemicals that have been isolated, identified, and reported thus far. Thymoquinone (30%–48%), thymohydroquinone, dithymoquinone, p-cymene (7%–15%), carvacrol (6%–12%), 4-terpineol (2%–7%), t-anethol (1%–4%), sesquiterpene longifolene (1%–8%), -pinene, and thymol are the most significant active substances. Additionally, there are a few additional substances present in black seeds in traces. Two distinct forms of alkaloids, pyrazol alkaloids or indazole ring carrying alkaloids, such as nigellidine and nigellicine, and isoquinoline alkaloids, such as nigellicimine and nigellicimine-N-oxide, are present in seeds. [16][17]

The isoquinoline alkaloids nigellicimine and nigellicimine-N-oxide, as well as the pyrazol alkaloids or indazole ring containing alkaloids nigellidine and nigellicine, are both present in seeds. Additionally, N. sativa seeds contain saponin, a possible anticancer compound, and alpha-hederin, a water-soluble pentacyclic triterpene [18].

6. MEDICAL USES

Asthma, rheumatoid arthritis, diarrhea, bronchitis, and skin conditions are just a few of the illnesses that are treated using N. sativa seeds. It functions as a liver tonic, anti-diarrhea agent, appetite stimulant, and emmenagogue. It is employed for treating digestive issues, boosting nursing women' milk production, battling parasite infections, and boosting immune function [19]. Since seeds have a relatively low level of toxicity, they are also utilized as flavoring additives in breads and pickles [20]. A skin eruption or worm infestation can be treated with seeds. An external local anesthetic and antiseptic are both utilized with oil. In order to prevent vomiting, roasted black seeds are ingested [21].

7. Nigella sativa External Application

Nigella sativa has been utilized for many years in cosmeceutical formulations, dermatological disorders, and the treatment of a variety of skin ailments [22]. For instance, it is used as an anti-inflammatory for various types of skin inflammation [22, 23] and to affect skin pigmentation [24, 25]. It is also used to treat burns, wounds, and injuries [26,27].

8. Pharmacological activities

The biological activities of N. sativa have been thoroughly investigated, and it has been found to have a wide range of biological effects including diuretic, anti-hypertensive, gastro-protective, antidiabetic, anticancer and immunomodulatory, analgesic, antimicrobial, analgesics and anti-inflammatory, and antioxidant qualities.

8.1 Antifungal

The majority of pathogenic fungi were resistant to nigella sativa oil's antifungal properties [28]. Most fungi were resistant to the antifungal effects of Candida tropicalis, Aspergillus flavus, and thymoquinone, the oil's primary component [28, 29]. N. sativa has an increasing antifungal action, according to researchers who researched the use of natural products to treat fungal infections [30,31,32]. A study was conducted on Tunisian N. sativa fixed oil to test its antibacterial and antifungal action, and the results provide support for the oil's traditional usage as a medication against both bacteria and fungi [33].

8.2 Wound Healing

Thymoquinone is said to act as an antioxidant, reduce oxidative harm, and stop membrane lipid peroxidation in tissues; these properties recommended using Nigella sativa topically to quicken wound healing [34].

He observed that when N. sativa seed ether extract was applied to skin, it accelerated the healing process by lowering the absolute and total white blood cell counts, minimizing tissue damage, and suppressing bacterial growth [35].

In a 2004 study, the ability of N. sativa extract to treat wounds was examined using a monolayer prototype of human gingival fibroblast. After utilizing the oil in the study, an increase in the rate of proliferation and closure activity were noted [36].

8.3 Anti-Inflammatory

Psoriasis is a common autoimmune, hyperproliferative skin ailment that can be unpleasant and irritating. To determine the effectiveness of an ethanol extract of Nigella sativa seeds in the treatment of psoriasis, an experimental investigation was conducted. When the case study group is compared to the control group, which received conventional treatment, it is discovered that N. sativa increases the epidermal thickness [37].

Both an ointment and an oral dose form of N. sativa oil were used. They had an IC50 of 23.9 g/ml, which is comparable to asiaticoside's IC50 of 20.13 g/ml. In conclusion, N. sativa oil outperformed the comparator treatment in terms of antiproliferative activity [38].

8.4 Acne Vulgaris

One of the most common illnesses affecting people today, acne vulgaris is regarded as an infectious condition. Numerous researches investigated how Nigella sativa oil combats acne vulgaris. When compared to 5% benzoyl peroxide lotion, which is the standard treatment for mild to moderate acne vulgaris, Hadi and Ashor (2010) found that using 20% N. sativa oil extract had superior efficacy and was less hazardous.[39]

For many years, people have applied N. sativa seeds topically to treat various skin conditions. Bhalani and Shah made the decision to evaluate the antibacterial effects of N. sativa oil and the common medication amoxicillin. Inhibition of the bacterial zone was similar for both treatments. In their most recent experiments, they created a gel dosage form using oil and Carbopol 940 and tested it as a treatment for acne vulgaris. They got good results [40].

8.5 Anti-oxidant Activity

The antioxidant pathway was revealed to be responsible for the hepatoprotective actions of oil and TQ. The protective effect of TQ against doxorubicin-induced cardiotoxicity (41,42) and nephrotoxicity (43) was also discovered to be attributable to antioxidant activity. TQ's antioxidant activity (44) played a role in both its moderating effect on benzopyrene-induced cancer in mice (45) and its anticancer effect on 20-methylcholanthrane-induced fibrosarcoma tumor genesis.

TQ was discovered to demonstrate renal protective effects in rats through its antioxidant action and (46,47) to also offer protection against CCl4-induced hepatotoxicity in mice (48), rats, and rabbits (49). Using chemiluminescence and spectrophotometric methods (50), the free radical scavenging properties of thymol, TQ, and dithymoquinone were investigated on reaction-generating reactive oxygen species, such as superoxide anion radical, hydroxyl radical, and singlet oxygen.

8.6 Antibacterial Activity

Using a modified paper disc diffusion technique, the antibacterial impact of ground black seeds was investigated. Using pure water as the control, a concentration of 300 mg/mL clearly inhibited the growth of Staphylococcus aureus. This inhibition was then verified by using the positive control Azithromycin. When compared to N. sativa ground seeds from Ethiopia, the inhibition produced with Hadramout-grown N. sativa seeds was greater. The two key active components of N. sativa, TQ and melanin, may be responsible for the positive inhibition[51]. Different crude extracts of N. sativa were tested for antibacterial potency against various bacterial isolates, which included 16 gram-negative

and 6 gram-positive samples. Multiple antibiotic resistances, particularly against gram negative drugs, were present in these isolates. N. sativa crude extracts demonstrated a good efficacy against certain of the test species. Water and crude alkaloid extracts were the most efficient extracts. Gram negative isolates were impacted more than gram positive isolates[52]. Hannan et al. (2008) examined the antibacterial activity of N. sativa against clinical isolates of methicillin-resistant Staphylococcus aureus. The ethanolic extract of N. sativa was sensitive to all tested strains of methicillin-resistant Staphylococcus aureus with a MIC range of 0.2-0.5 mg/mL[53]. Patients with non-ulcer dyspepsia were treated with triple therapy to eradicate Helicobacter Pylori and N. sativa's antibacterial properties. The anti-H. pylori activity of N. sativa seeds has been demonstrated to be clinically helpful and comparable to triple therapy[54]. On 11 human pathogenic bacteria, TQ's antibacterial activity and its capacity to suppress biofilm growth were examined. Staphylococcus aureus ATCC 25923 and Staphylococcus epidermidis CIP 106510, two Gram positive cocci, were particularly susceptible to TQ's considerable bactericidal action. TQ stopped cells from sticking to the surface of glass slides[55,56].

9. BIOACTIVE COMPOUND

9.1 Volatile Compounds

It has been determined by several research that various types of compounds are present in the NS essential oil (Figure 1). Sesquiterpenes, monoterpenoid alcohols, monoterpene, diterpene, and ketone are among them. We mention thymol, carvacrol, Phellandrene, α-pinene, β-pinene, thymoquinone (TQ), and thymohydroquinone among them [57,58].

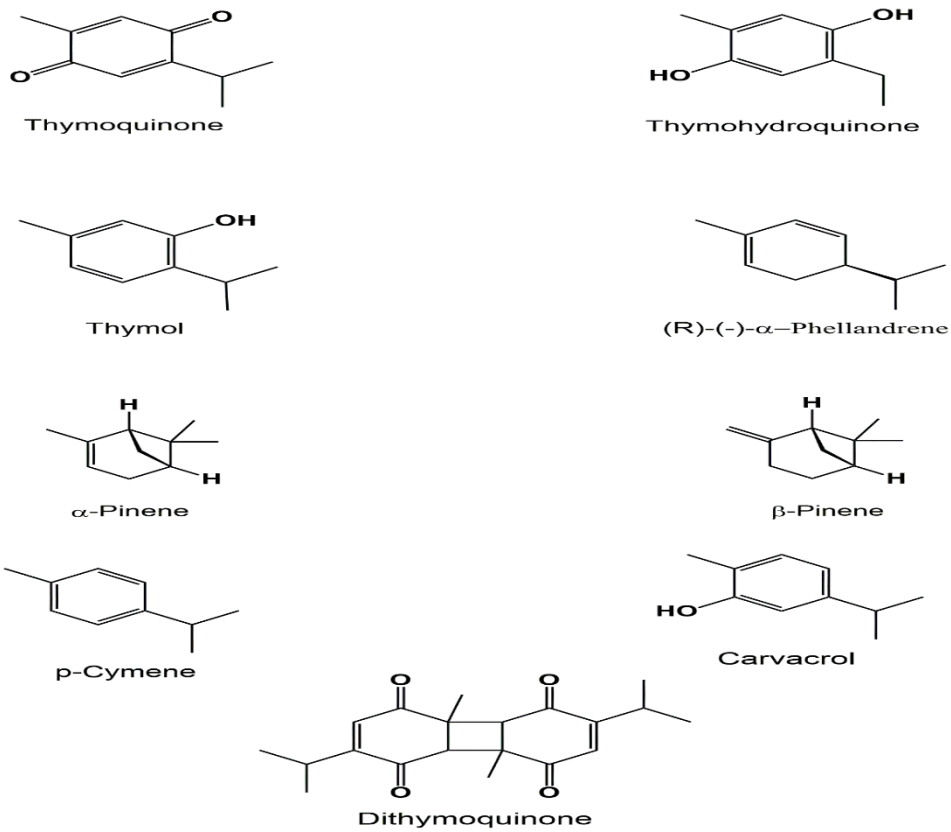

Figure 1. Some of the chemical compounds identified in the black cumin seeds using the GC-MS.

9.2 Alkaloids

From 1985 to 1995, various NS alkaloids were isolated and identified (Figure 3). These included nigellicine, which is made up of an indazole nucleus [59], nigellimine, an isoquinoline molecule[60], nigellimine N-oxide, and nigellidine, an indazole molecule [61]. On the other hand, magnoflorine, a different chemical, was only discovered in the NS plant's aerial section [62].

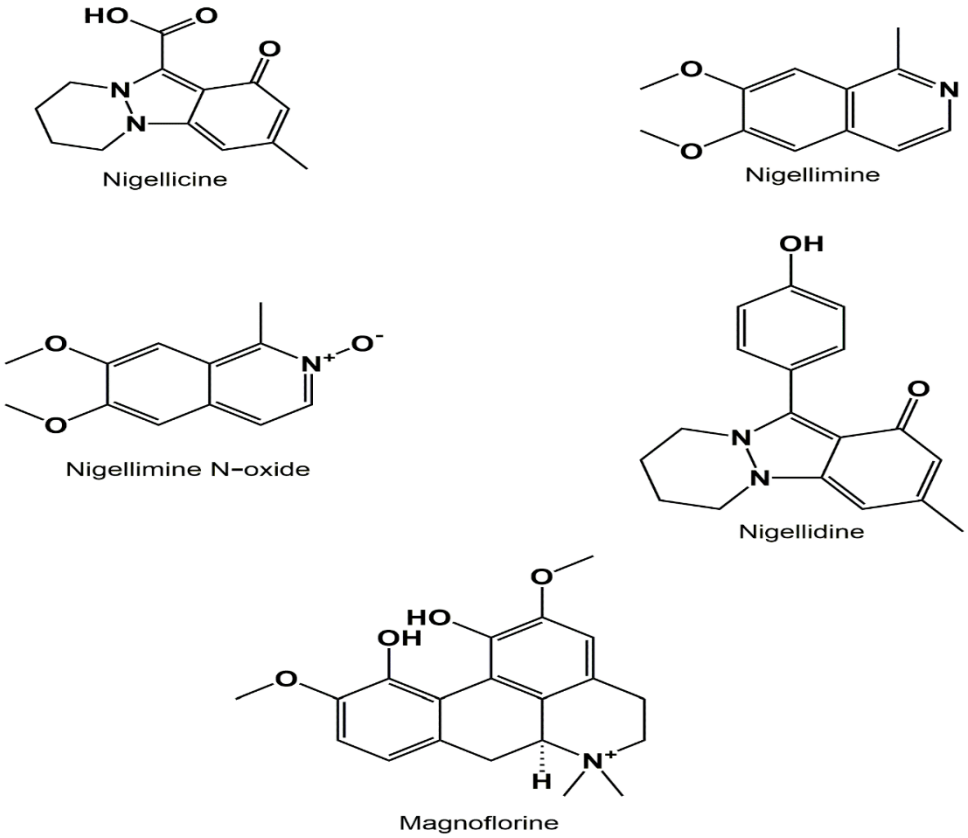

Figure 3. Nigella sativa isolated and identified alkaloids.

9.3 Fatty Acids

The black cumin seeds were found to contain crude fiber, minerals (Na, Cu, Zn, P, and Ca), and vitamins such as thiamine, niacin and folic acid [63]. Furthermore, the NS pos- sesses different types of fatty acids that were determined using the GC-MS technique [64,65] (Figure 5). The linoleic acid (55.6%) was among the most abundant fatty acids present in the NS seeds, followed by oleic acid (23.4%), and palmitic acid (12.5%). While, stearic acid, lauric acid, myristic acid, linolenic acid, and Eicosadienoic acid are present in small amounts with a percentage ranging from 0.5% to 3.4% [66].

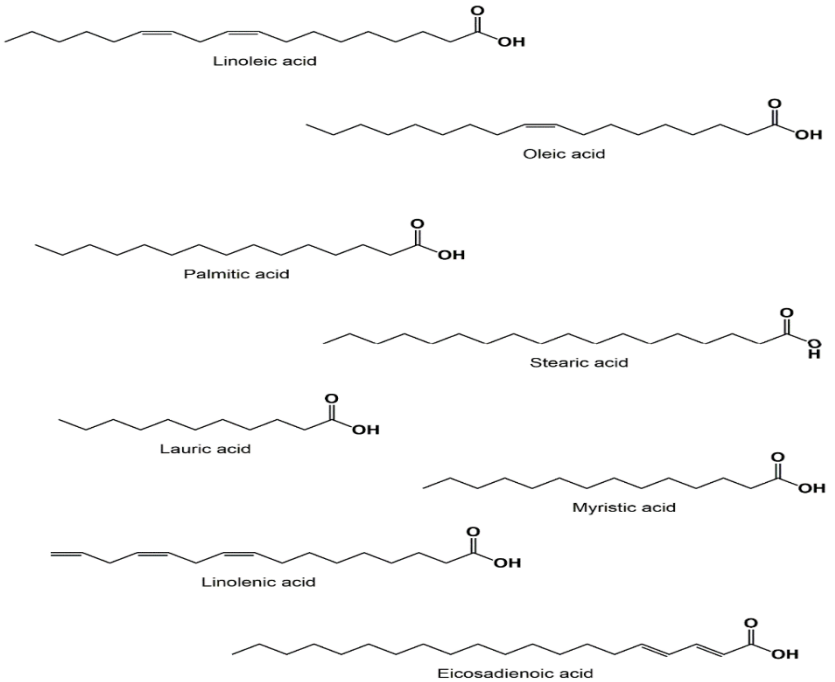

Figure 5. Examples of fatty acids found in NS seeds.

CONCLUSION:

Nigella Sativa is widely referred to as black seed. Its seeds and oil have been widely used in the treatment of various diseases worldwide. In this review, Cultivation and collection,chemical composition and pharmacological activity of Nigella Sativa is been shown. Different pharmacological activities such as antibacterial, antiviral, antifungal activity, hair loss, antioxidant property, preservative property, sun protection, wound healing activity, antiinflammatory activity, antiaging activity, anticancer activity, skin pigmentation, antidiabetic activity, antioxytocic activity, cosmetic application, gastro-protective activity, cardiovascular activity, nephroprotective activity, pulmonary-protective activity and anti-asthmatic activity and hepato-protective activity.

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