



## Review Article

**An Overview: Phytoconstitute and Pharmacological Activity of *Nigella Sativa***

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*Keywords:**Nigella sativa*,  
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The medicinal herb *Nigella sativa* (*N. 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 *N. sativa* seeds in the past. It is regarded as one of the greatest healing arts in Islamic literature. Its seeds and oil are frequently used to treat a variety of illnesses, such as rheumatoid arthritis, asthma, inflammatory diseases, diabetes, and digestive disorders. This study's goal was to give an in-depth analysis of the scientific publications that have been published concerning *N. sativa*.

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**INTRODUCTION**

Since ancient times, the use of medicinal plants to heal human ailments has been considered. A plant known as a medicinal herb has the power to alter pathological and physiological processes and can be utilized to treat or prevent disease. Due to a number of reasons, including ease of access without a prescription, affordability, lack of dependence on medical professionals, and the perception that natural remedies have fewer side effects than chemical drugs, the use of medicinal plants has increased significantly in recent years [1].

According to a WHO report from 2008, ethnopharmacology, herbal medicine, or phytomedicine is the use of plants for therapeutic and medical purposes to treat illnesses and enhance human health. According to the World Health Organization (WHO), herbal medicines are finished, branded pharmaceutical products that include an active component, aerial, subterranean, or other plant material [2].

Black seed (*Nigella sativa*) a plant with a wide range of medical characteristics that is native to

southwest Asia and has a rich historical and cultural history, is one of the medicinal plants that is commonly utilised in Iran [3, 4]. In the Middle East and Southeast Asia in particular, *N. sativa* seeds have been utilised to boost health and battle disease [5]. In South Asia, *N. sativa* is referred to as Kalonji, in Arabic as Habbat-ul-Sauda, and in English as black cumin frequently [6].

***Nigella Sativa***

An annual herbaceous blooming plant in the Ranunculaceae family *Nigella sativa* Linn., South and south-west Asia is the original home of *Nigella sativa*. The *Nigella sativa* plant is commonly grown in Western Asia, Europe, the Mediterranean region, and India. It has linear, finely split leaves and reaches 20–30 cm tall. Typically, flowers have five to ten petals and are light blue and white in color. The flowers are bluish in color and have a varied number of sepals in their natural state. They are distinguished by the presence of nectaries. The solitary fruits of the gynoeceum are partially linked to form a capsule-like structure, and the gynoeceum is made up of a variable number of multiovule carpels that develop into follicles after pollination. A huge, inflated capsule with three to seven joined follicles that individually carry seeds makes up the fruit. The integument

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of *Nigella sativa* seeds is corrugated and the seeds range in size from 1 to 5 mm [7].

The seeds are often used as a spice to enhance foods, particularly cheese and baked goods. *Nigella sativa* seeds are consumed with honey and syrup, used to make a classic sweet dish, and sprinkled over bread [8, 9].



**Figure 1:** *Nigella sativa*

#### **Taxonomic Classification:**

Kingdom	: Plantae
Subkingdom	: Tracheobionta
Super division	: Spermatophyta
Division	: Magnoliophyta
Class	: Magnoliopsida
Order	: Ranunculales
Family	: Ranunculaceae
Genus	: <i>Nigella</i> L.
Species	: <i>N. sativa</i>

#### **Synonym of *N. Sativa* in Various Languages**

English	: Fennel flower Black cumisns, Love-in-a-mist., nutmeg flower, Roman coriander
Arabic	: Habatut Barakah Shooneez, Habba Sauda, Habb al-barka
Sanskrit	: Krishana – Jiraka, Upakunchika
German	: Schwarzkümmel
Chinese	: Pei heizhongcao
French	: Cheveux de Vénus, Nigelle
Hindi	: Kalonji
Marathi	: KalonjiJire
Persian	: Siah Dana
Punjabi	: Kalvanji
Urdu	: Kalonji

#### **Phytochemical Profiles:**

##### **Terpenes and Terpenoids**

The terpenes and terpenoids family, which is the main chemical family of black cumin, is made up of thymoquinone (TQ) and its derivatives, including carvacrol, 4-terpineol, -pinene, thymol, t-anethol, dithymoquinone, p-cymene, sesquiterpene longifolene, and several other compounds. The presence of quinine components the most common of which is TQ, accounts for the majority of the diversity in the pharmacological properties of black cumin [10].

##### **Phytosterols**

Black cumin oil contains various sterols, with sitosterol (44-54%) serving as the primary sterol. Stigmasterol, which makes up 16.57-20.92% of all sterols in black cumin oil, is the second most important sterol. A lesser amount of cholesterol and campesterol are also present in the oil. Black cumin is a powerful natural agent in decreasing blood cholesterol and avoiding cardiovascular diseases [11] because to the presence of substantial quantities of sterols.

##### **Alkaloids**

The isoquinoline alkaloids, such as nigellicimine and nigellicimine-N-oxide, and the pyrazole or indazole alkaloids, such as nigellidine and nigellicine, can be used to categorise the alkaloids of black cumin. Additionally, the diterpene family alkaloid nigelamines A1–A5 from black cumin have been described and are said to have strong lipid metabolism-promoting properties [12].

##### **Tocols**

Natural compounds called tocopherols are potent free radical scavengers and lipid peroxidation inhibitors in biological membranes. Tocopherols come in four different isomers called alpha, beta, gamma, and delta, which can be identified by the position of the methyl group on the chromanol ring. With a range of 8.57 to 34.23 ppm, tocopherol concentration is the highest among the several tocopherols. The extraction techniques used may have an impact on the concentration of tocopherol isomers. Black cumin may have different amounts of tocopherol isomers due to differences in the growing regions, maturation times, and storage conditions [13, 14].

##### **Polyphenols**

Using HPLC-UV-MS, a total of 19 polyphenols were isolated from seeds. These include caffeic

acid, caftaric acid, gentisic acid, chlorogenic acid, p-coumaric acid, ferulic acid, sinapic acid, and cichoric acid. Other compounds include hyperoside, isoquercitrin, rutin, myricetin, fisetin, quercitrin, quercetin, patuletin, luteolin, and kaempferol. Black cumin was found to contain the largest amounts of quercetin and kaempferol among these, with 105.55 0.12 and 12.15 0.04 µg/g dry weight of plant material, respectively. Kaempferol, an antioxidant polyphenol, aids in preventing oxidative cell damage, and quercetin guards against a number of illnesses like osteoporosis, lung cancer, and cardiovascular issues. Additionally, it has been demonstrated that kaempferol prevents arteriosclerosis by preventing platelet production and low-density lipoprotein oxidation in the blood [15-17].

### Miscellaneous Components

Black cumin is now considered to be an enriched natural product due to the addition of several other chemical components, including special carbohydrates (rhamnose, xylose, and arabinose), glycerolipids (monoacylglycerols, diacylglycerols, and triacylglycerols), phospholipids (phosphatidylinositol, phosphatidylcholine, and phosphatidylglyce.

### Pharmacological Activities of *Nigella Sativa*

#### Anticancer Effects

According to certain research, *Nigella sativa* and its key ingredient, thymoquinone, have anticancer properties that are believed to kill cancer cells or stop genetic alterations in healthy cells. Antioxidant, anticarcinogenic, and antimutagenic effects are all attributed to thymoquinone. Numerous studies have demonstrated the antioxidant effects of *N. sativa* and thymoquinone as well as how they boost the activity of antioxidant enzymes such glutathione peroxidase, catalase, superoxide dismutase, and dismutase. Since oxidative stress plays a significant role in the initiation and progression of several cancer types and thymoquinone boosts the activity of the antioxidant enzymes indicated above, it is probable that *N. sativa* beneficial effects on cancer types are caused by an antioxidant effect [18-20].

#### Anti-bacterial Activity

Numerous researches have demonstrated *N. sativa*'s antimicrobial properties. The primary chemical component of this plant that has been identified is thymoquinone. The majority of bacteria, particularly Gram-positive cocci like

*Staphylococcus aureus* and *Staphylococcus epidermidis*, were shown to be resistant to it [21].

#### Antiviral Agent

It has been demonstrated that *N. sativa* increases the ratio of helper to suppressor T cells in humans as well as the activity of natural killer (NK) cells. Otherwise, it has been shown to be an effective inhibitor of murine CMV and the HIV protease. With the reported generation of interferon-gamma (INF-), it was discovered that M-phi and CD4+ve T cells increased in number and function [22].

#### Wound Infection

Evaluations of *N. sativa*'s ability to cure wounds in mice, farm animals, and human gingival fibroblasts were conducted. The accumulating results showed a decrease in absolute differential WBC counts, local inflammation and infection, bacterial growth and tissue damage, and free radical generation. Additionally, transforming growth factor beta and basic fibroblast growth factor levels were found to be higher [22].

#### Antioxidant Activity

In order to assess the antioxidant property of *Nigella sativa* extracts, numerous *in-vivo* and *in-vitro* research have been carried out. It was discovered that *Nigella sativa* and its derivatives may have the ability to scavenge free radicals and have an anti-oxidant impact. Cherif et al. examined oxidative activity and the impact of eating *Nigella sativa* seeds on the fatty acids in meat. For the investigation, 28 male Barbarine lambs were chosen. The diet was administered using either a higher or lower concentration feeding technique. In the end, it was found that the meat of lambs receiving NSS had less thiobarbituric acid reactive compounds (TBARS) than lamb meat in general [23, 24].

#### Anti-diabetic Effects

It has been demonstrated that *nigella sativa* and the active ingredient in it, thymoquinone, help diabetics control their blood sugar and lipid profiles. Despite the lack of complete understanding of the molecular mechanism underlying thymoquinone's effects on insulin secretion, it is known that thymoquinone increases glucose use by increasing serum concentration, lowering high levels of serum glucose, and lowering blood glucose by preventing gluconeogenesis [25].

### Antioxytotic Effects

The fact that *N. sativa* seeds oil inhibits the contraction of uterine smooth muscles brought on by oxytocin stimulation in rat and guinea pig uterine smooth muscles points to the oil's anti-oxytotic potential [26].

### Cardiovascular System (CVS)

TQ appears to lower systolic blood pressure, leukocytes, IL-6, and plasma SOD activity that are caused by motor fuel (diesel particulate). Additionally, platelet counts and prothrombin events rather than platelet aggregation are prevented from falling. With an increase in high-density lipoprotein-C (HDL-C) levels, the black seed oil decreased total cholesterol (TC), low-density lipoprotein-C (LDL-C), and thyroglobulin (TG) levels [27, 28].

### Antifungal Effects

Mice with candidiasis are inhibited by the aqueous extract of *N. sativa* seeds. Using the Agar diffusion method, the antidermatophyte activity of thymoquinone and the ether extract of *N. sativa* was evaluated against eight species of dermatophytes, including four species of Trichophyton rubrum and one each of Trichophyton interdigitale, Trichophyton mentagrophytes, Epidermophyton floccosum, and Microsporum canis. Thymoquinone and the ether extract of *N. sativa* exhibit inhibitory action against fungi strains. The outcomes demonstrate *N. sativa*'s potential as a source for antidermatophyte medications. In another study, dithymoquinone, thymohydroquinone, and thymoquinone were tested *in vitro* for their anti-yeast activity against six species of dairy spoilage yeast. Both thymohydroquinone and thymoquinone had potent anti-yeast properties [29-30].

### CONCLUSION

Herbal drugs are widely used as traditional medicine and are becoming more and more well-known worldwide. One of these is *N. sativa*, which has been used for many illnesses as a natural remedy since antiquity. The Bible, the Tibb-e-Nabwi, the Canon of Medicine, and Ayurvedic literature all mention its use. Numerous studies support its use in traditional medicine as an analgesic, immunological stimulant, anti-inflammatory, anti-microbial, anti-fungal, anti-oxidant, and anti-cancer agent. It may be desirable to conduct additional research to learn more about the pharmacokinetics, biochemical, and therapeutic functions of active

ingredients and how they interact with contemporary medications.

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