IJP (2026), Vol. 13, Issue 3 **(Review Article)**

Received on 28 February 2026; received in revised form, 18 March 2026; accepted, 20 March 2026; published 31 March 2026

NIGELLA SATIVA: A COMPREHENSIVE REVIEW OF ITS PHARMACOLOGICAL AND THERAPEUTIC PROPERTIES

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Keywords:

Nigella sativa, Ranunculaceae, Thymoquinone, Therapeutic uses

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ABSTRACT: In ancient systems like Unani, Tibb, Ayurveda, and Siddha, *Nigella sativa* is a frequently utilized medicinal herb. Its oil and seeds have long been used in food and healing. *N. sativa* is suggested in Tibb-e-Nabwi (Prophetic Medicine) and is considered a key medicinal cure in Islamic literature. In addition to being used as analgesics, diuretics, and hunger stimulants, the seeds have been used to treat hypertension, liver ailments, digestive difficulties, diarrhea, and skin concerns. Numerous pharmacological actions, such as anticancer, antidiabetic, immunomodulatory, renal-protective, anti-inflammatory, antimicrobial, bronchodilator, spasmolytic, hepato-protective, gastro-protective, and antioxidant properties, are shown by scientific research. The main bioactive substance, thymoquinone, is responsible for the majority of therapeutic advantages. This review aims to provide a comprehensive survey of the pharmacognosy, chemical composition, and pharmacological properties of *N. sativa* seeds.

INTRODUCTION: For ages, indigenous and traditional medical systems have utilized medicinal plants to treat a wide range of illnesses. They are often regarded as safer than contemporary allopathic medications and are essential to the manufacture of herbal remedies [1]. Only a small number of plant species have had their pharmacological characteristics, modes of action, safety profiles, and toxicological features adequately examined despite their widespread usage. Black seed, or *Nigella sativa* (family Ranunculaceae), is one of these plants that has attracted a lot of interest because of its rich religious and historical heritage as well as its amazing medicinal potential.

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.IJP.13(3).184-93

Article can be accessed online on: www.ijpjournal.com

DOI link: https://doi.org/10.13040/IJPSR.0975-8232.IJP.13(3).184-93

Native to Southwest Asia, North Africa, and Southern Europe, it is extensively grown in the Middle East, the Mediterranean, India, Pakistan, Syria, Turkey, and Saudi Arabia [2]. *Nigella sativa's* seeds and oil are widely used around the world to cure a broad range of illnesses, and they play a significant role in traditional Indian medical systems like Ayurveda and Unani. Black seed is highly prized in Islamic tradition and is included in Prophetic medicine (Tibb-e-Nabwi) as a cure for every illness, with the exception of death. Numerous pharmacological effects, such as diuretic, antihypertensive, antidiabetic, immunomodulatory, anti-inflammatory, gastro-protective, and hepatoprotective qualities, have been shown by scientific research [3, 4].

In addition to being a digestive stimulant, appetite enhancer, and lactation promoter, it is frequently used to treat ailments including asthma, bronchitis, diarrhea, rheumatism, skin diseases, and liver malfunction. Thymoquinone, the main bioactive

component in its essential oil, is responsible for many of its medicinal benefits. Additionally, because of their unique flavor and low toxicity, black seeds are utilized as a flavoring in meals like bread and pickles.

Taxonomy:

- Kingdom: Plantae
- Clade: Angiosperms
- Clade: Eudicots
- Order: Ranunculales
- Family: Ranunculaceae
- Genus: Nigella
- Species: Nigella sativa

Vernacular (Common) Names:

- English: Black cumin, Black seed, Black caraway
- Hindi: Kalonji
- Urdu: Kalonji
- Arabic: Habbatul barakah / Habba Sawda
- Sanskrit: Upakunchika / Krishnajiraka
- Bengali: Kalo jeera
- Tamil: Karunjeeragam

Geographic Distribution, Collection & Cultivation: Originally from Western Asia and Eastern Europe, *Nigella sativa* is found across Southern Asia, the Middle East, Northern Africa, and Southern Europe. It is a versatile and robust crop due to its capacity to adapt to many soil types and climatic conditions. Naturally, it may be found in nations like Bulgaria, Romania, Cyprus, Turkey, Iran, and Iraq. It has expanded to portions of Europe, North Africa, and the Far East, including Myanmar. Its wide ecological flexibility is demonstrated by the fact that it is grown in several Indian states and flourishes in a variety of climates, from hot and humid to cold and dry. *Nigella sativa* is often produced as a rabi crop in India, where it is seeded in October or November and harvested in March or April, sometimes even in May or June in mountainous areas. Seeds are picked while the pods are somewhat green to avoid cracking and loss and to preserve the fragrant oil as best as possible [5, 6]. To increase production, many harvests are frequently made. To preserve their flavor and potency after drying, the seeds are kept in sealed containers in cold, dark locations. The plant can withstand moderate to severe rains as long as the soil is not soggy, and it thrives in well-drained sandy or loamy soils with a pH of 7 to 7.5. It is appropriate for organic farming methods, where manure and organic fertilizers are frequently used to improve soil fertility and encourage sustainable production, due to its minimal water and care requirements.

Morphology of the Plant [7]:

Habit: *Nigella sativa* is an annual, erect, herbaceous plant that typically grows to a height of about 20–60 cm. The plant is delicate in appearance with finely divided foliage and branched stems.

Root: It possesses a well-developed taproot system with lateral branches that help anchor the plant and absorb nutrients efficiently from well-drained soils.

Stem: The stem is erect, green, smooth, and highly branched. It is slender and may appear slightly angular. The branching pattern gives the plant a bushy appearance.

Leaves: Leaves are alternate, finely dissected, and linear to thread-like (filiform) in shape. They are pinnately or bipinnately divided into narrow segments, giving a feathery appearance.

Flowers: The flowers are solitary, terminal, and actinomorphic (radially symmetrical). They are usually pale blue, white, or light purple in color. The flower consists of 5–10 petal-like sepals, while the true petals are small and nectary in nature. Numerous stamens surround a multi-carpellary ovary.

Fruit: The fruit is a large, inflated capsule formed by the fusion of 3–7 follicles. It is green when immature and turns brown upon ripening. The capsule contains numerous seeds.

Seeds: Seeds are small, trigonous (triangular), black in color, and have a rough surface. They possess a characteristic aromatic odor and a slightly bitter, pungent taste due to the presence of volatile oil (mainly thymoquinone).

FIG. 1: *N. SATIVA* (WHOLE PLANT& FLOWER)

Chemical Composition of *Nigella sativa*: Both volatile and non-volatile oils, proteins, carbohydrates, minerals (such as iron, calcium, potassium, magnesium, zinc, and copper), vitamins A and C, and phytochemicals like sterol (such as β-sitosterol, campesterol, stigmasterol, and 5-avenasterol) and saponins, phenolic compounds, alkaloids, lipid constituents, and fatty acids (such as linoleic, linolenic, oleic, and stearic acids).

The composition of NS essential oils has been found to contain over forty different compounds with varying concentrations, including trans-anethole, p-cymene limonene, carvone, α-thujene, α-thujene, thymoquinone (TQ) **Fig. 2A**, thymohydroquinone (THQ) **Fig. 2B**, dithymoquinone (DTQ) **Fig. 2C**, thymol (THY) **Fig. 2D**, carvacrol, and β-pinene. The most significant component in these seeds is TQ.

Supercritical carbon dioxide may be used to produce NS seed oil at 40 °C and pressures ranging from 10 to 35 MPa [8]. It was found that the extraction concentrated on polyunsaturated fatty acids appropriate for the food sector at higher pressures (35 MPa), whereas thymoquinone-rich fractions, perfect for health uses, were produced at lower pressures (10–15 MPa) [9]. When extracting bioactive lipids from NS seeds, hexane can be substituted with 2-methyltetrahydrofuran (MeTHF), an eco-friendly solvent. MeTHF extraction was shown to yield more (34%) than the traditional hexane approach (29%). MeTHF improved the extraction of important phenolic compounds like thymol, and the oil extracted from NS was high in linoleic acid (61%) and oleic acid (19%) [10].

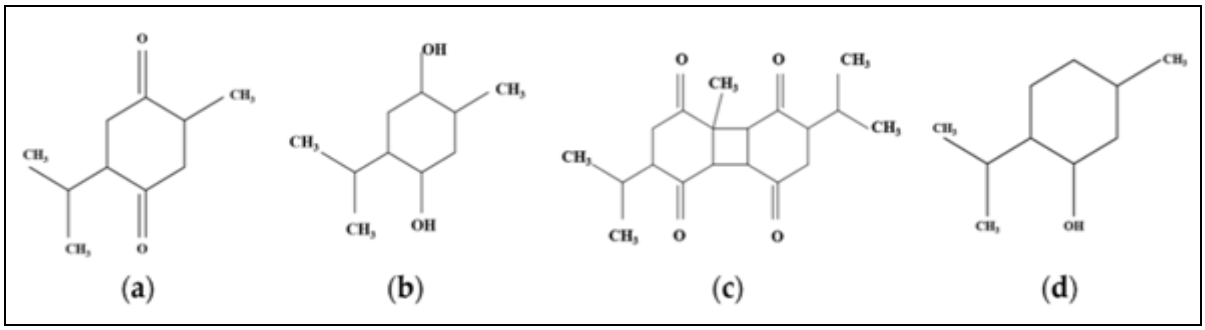

FIG. 2: STRUCTURES OF THE MAJOR BIOACTIVE CONSTITUENTS OF *NIGELLA SATIVA*: (a) thymoquinone, (b) thymohydroquinone, (c) dithymoquinone, and (d) thymol [8]

Traditional uses of Folk Remedies: *N. sativa* has long been used to treat a wide range of illnesses and conditions related to the respiratory system, digestive tract, kidney and liver function, cardiovascular system, immune system support, and overall health [9–11]. In "The Canon of Medicine," Avicenna alludes to black seeds because they boost vitality and aid in recuperation from exhaustion and depression. In Arabian and Indian tradition, black seeds and their oil have long been used as food and medicine [12]. In Southeast Asian and Middle Eastern nations, the seeds have long been used to cure a variety of illnesses, including as rheumatism, bronchitis, asthma, and other inflammatory conditions. *Nigella's numerous* applications have given it the Arabic title "Habbatul barakah," which translates to "seed of blessing." Indigestion, appetite loss, diarrhea, dropsy, amenorrhea, dysmenorrhea, worms, and skin eruptions can all be treated using a tincture made from the seeds. The oil is used externally as a local anesthetic and antiseptic. Internal administration of roasted black seeds prevents vomiting [13].

Scientific Researches and Pharmacological Potentials: Numerous researchers conducted comprehensive studies on *N. sativa* using contemporary scientific methods since it is thought to be a magical plant that can treat a variety of illnesses and problems. Over the past few decades, *N. sativa's* pharmacological activities have been studied [14, 15].

TABLE 1: ANTIBACTERIAL ACTIVITY [16, 17]

S. no.	Study / Extract Tested	Test Organism(s)	Method / Concentration	Key Findings
1	Ground seeds of *Nigella sativa*	*Staphylococcus aureus*	Modified paper disc diffusion method; 300 mg/mL; distilled water as control; Azithromycin as positive control	Clear inhibition observed. Seeds from Hadramout showed higher inhibition than Ethiopian seeds. Activity attributed to thymoquinone (TQ) and melanin.
2	Crude extracts (alkaloid and aqueous extracts) of *Nigella sativa*	16 Gram-negative and 6 Gram-positive bacterial isolates (multi-drug resistant strains)	Antimicrobial screening	Promising antibacterial activity observed. Crude alkaloid and aqueous extracts were most effective. Gram-negative bacteria were more susceptible than Gram-positive.
3	Ethanolic extract of *Nigella sativa*	Methicillin-resistant *Staphylococcus aureus* (MRSA) clinical isolates	4 mg/disc; MIC range: 0.2–0.5 mg/mL	All tested MRSA strains were sensitive to the extract.
4	*Nigella sativa* seeds (clinical study)	*Helicobacter pylori* in non-ulcer dyspepsia patients	Compared with triple therapy	Demonstrated clinically useful anti-*H. pylori* activity comparable to standard triple therapy.
5	Thymoquinone (TQ)	11 human pathogenic bacteria (especially *Staphylococcus aureus* ATCC 25923 and *Staphylococcus epidermidis* CIP 106510)	Antibacterial and biofilm inhibition assay	Significant bactericidal activity, particularly against Gram-positive cocci; inhibited bacterial adhesion to glass surfaces.

TABLE 2: ANTI-SCHISTOSOMIASIS ACTIVITY [18, 19]

S. no.	Extract / Treatment	Test Organism / Model	Parameters Studied	Key Findings
1	NSO (*Nigella sativa* oil) alone and in combination with PZQ	*Schistosoma mansoni*-infected mice	Worm burden, ova count (liver & intestine), liver enzymes (ALT, GGT, AP), serum albumin	NSO alone reduced worm load and ova deposition. Combination with PZQ further reduced dead ova compared to PZQ alone. NSO partially corrected elevated ALT, GGT, AP and improved serum albumin levels, indicating hepatoprotective and anti-schistosomal effects.
2	*Nigella sativa* seeds (in vitro study)	*Schistosoma mansoni* (miracidia, cercariae, adult worms)	Biocidal activity, egg-laying inhibition, antioxidant and metabolic enzyme activity	Strong biocidal effect against all parasite stages; inhibited egg-laying. Induced oxidative stress in adult worms by decreasing SOD, glutathione peroxidase, glutathione reductase, hexokinase, and glucose-6-phosphate dehydrogenase activities.
3	AGE (Garlic extract) and NSO	Normal and *Schistosoma mansoni*-infected mice	Hematological, biochemical, and antioxidant parameters	AGE and NSO prevented most hematological and biochemical alterations and significantly improved antioxidant status in infected mice. Suggested as complementary agents to standard schistosomiasis treatment.

TABLE 3: ANTI-INFLAMMATORY AND ANALGESIC ACTIVITY [20-23]

S. no.	Extract / Treatment	Model / Test System	Parameters Studied	Key Findings
1	Aqueous extract of *N. sativa*	Animal models	Anti-inflammatory, analgesic, antipyretic activities	Exhibited anti-inflammatory and analgesic effects but no antipyretic activity.
2	Alcoholic	Lipopolysaccharide-	Nitric oxide production	Callus extract had 12× higher TQ than seed

	extracts of seeds and callus (TQ content)	inflamed rat mixed glial cells		extract. Both extracts significantly reduced NO production (callus: 0.2–1.6 mg/mL; seeds: 1.25–20 µL/mL).
3	*N. sativa* and TQ	Osteoporosis models	Inflammatory cytokines (IL-1, IL-6), NF-κB	Inhibited inflammatory cytokines and transcription factor NF-κB; showed anti-osteoporotic potential.
4	TQ	Pancreatic ductal adenocarcinoma (PDA) cells	Pro-inflammatory cytokines (MCP-1, TNF-α, IL-1β, COX-2), HDAC activity, apoptosis	Dose- and time-dependent reduction of cytokines; increased p21 WAF1, inhibited HDAC, induced histone hyperacetylation. Combines anti-inflammatory and proapoptotic effects.
5	TQ	Mouse model of allergic airway inflammation	COX-1 expression, PGE2, PGD2, Th2 immune response	Slight inhibition of COX-1 and PGE2; reduced allergic lung inflammation via inhibition of PGD2 synthesis and Th2 response.
6	Methanol extracts (shoots, roots, seeds), hexane fraction	LPS-stimulated RAW 264.7 macrophages	Nitric oxide release	Seeds hexane fraction showed strong anti-inflammatory activity, IC_{50} = 6.20 µg/mL.
7	*N. sativa* oil (clinical trial)	Patients with allergic rhinitis (n=66, double-blind)	Nasal congestion, runny nose, itching, sneezing, turbinate hypertrophy, mucosal pallor	Reduced nasal symptoms significantly by day 15; supports use for allergic rhinitis when other drugs are unsuitable.

TABLE 4: ANTIFUNGAL ACTIVITY [24, 25]

S. no.	Extract / Compound Tested	Test Organism(s)	Method / Model	Key Findings
1	Methanolic, chloroform, and aqueous extracts of *Nigella sativa*	*Candida albicans*	*In-vitro* antifungal assay	Methanolic extract showed strongest antifungal activity, followed by chloroform extract. Aqueous extract showed no activity.
2	Plant extract of *Nigella sativa*	*Candida albicans* (infected mice; liver, spleen, kidneys)	Intravenous inoculation in mice; post-treatment after 24 h	Significant reduction in fungal load: 5-fold (kidneys), 8-fold (liver), 11-fold (spleen). Confirmed by histopathology.
3	Ether extract and thymoquinone (TQ) of *Nigella sativa*	Dermatophytes: *Trichophyton rubrum* (4 spp.), *Trichophyton interdigitale*, *T. mentagrophytes*, *Epidermophyton floccosum*, *M.canis*	Agar diffusion method; serial dilutions	MIC (ether extract): 10–40 mg/mL; MIC (TQ): 0.125–0.250 mg/mL; Compared with griseofulvin (0.00095–0.01550 mg/mL). Supports use in fungal skin infections.
4	Quinones: Dithymoquinone, Thymohydroquinone, Thymoquinone (TQ)	Six dairy spoilage yeast species	Broth microdilution method; compared with calcium propionate, natamycin, potassium sorbate (pH 4.0 & 5.5)	Thymohydroquinone and TQ showed significant antiyeast activity.
5	Defensins (Ns-D1 and Ns-D2) isolated from *Nigella sativa* seeds	Various phytopathogenic fungi	Isolation and antifungal activity evaluation	Ns-D1 and Ns-D2 exhibited strong and diverse antifungal activity against several plant pathogenic fungi.

TABLE 5: ANTIDIABETIC ACTIVITY [26-29]

S. no.	Extract / Treatment	Experimental Model	Parameters Evaluated	Key Findings
1	α-Lipoic acid (α-LA), L-carnitine, *Nigella sativa*, and combination	STZ-induced diabetic rats (65 mg/kg)	Fasting glucose, insulin, insulin sensitivity, HOMA, C-peptide, PDH activity	α-LA or *N. sativa* reduced blood glucose. Combination therapy significantly increased insulin and C-peptide, improving carbohydrate

				metabolism in diabetes.
2	*N. sativa* aqueous extract, oil, and Thymoquinone (TQ)	STZ-induced diabetic rats	Serum glucose, insulin, SOD, pancreatic MDA, ultrastructure	Reduced glucose and MDA; increased insulin and SOD. TQ showed strong protection of pancreatic β-cells and reduced oxidative stress.
3	Volatile oil of *Nigella sativa*	STZ-induced diabetic rats (50 mg/kg)	Insulin immunoreactivity, β-cell ultrastructure	Preserved β-cell integrity, increased insulin staining, reduced mitochondrial damage.
4	Thymoquinone (20, 40, 80 mg/kg for 45 days)	STZ–Nicotinamide-induced diabetic rats	Insulin, Hb, HbA1c, glucose, hepatic carbohydrate enzymes	Dose-dependent antihyperglycemic effect; 80 mg/kg restored enzyme activity and improved glycemic status.
5	*Nigella sativa* + Human parathyroid hormone	Insulin-dependent diabetic rats	Bone mass, connectivity, strength	Combination showed synergistic improvement in bone parameters compared to single treatments.
6	*Nigella sativa* oil (clinical study)	Patients with insulin resistance syndrome	Clinical & biochemical parameters	Effective as add-on therapy; improved diabetic and dyslipidemic parameters.
7	*Nigella sativa* (mechanistic observation)	Diabetic & glucose-intolerant subjects	Insulin secretion & intestinal glucose absorption	Enhanced glucose-induced insulin secretion and reduced intestinal glucose absorption.
8	*Nigella sativa* seeds (2 g/day)	Type 2 diabetic patients (adjuvant therapy)	Fasting glucose, 2 h postprandial glucose, HbA1c	Significant reduction in FBG, 2 hPG, HbA1c without change in body weight.
9	*Nigella sativa* seed ethanol extract (NSE)	Diabetic *Meriones shawi*	Glycemia, lipid profile, insulin, leptin, adiponectin, ACC phosphorylation, Glut4	Normalized glycemia; improved insulin sensitivity via AMPK pathway and increased muscle Glut4 content.

TABLE 6: CARDIOVASCULAR ACTIVITY [30]

S. no.	Compound / Treatment	Experimental Model	Parameters Studied	Key Findings
1	Thymoquinone (TQ)	Mice exposed to diesel exhaust particles (DEP)	Lung inflammation, lung function, leukocyte count, IL-6, systolic BP, SOD activity, platelet numbers, *in-vivo* thrombosis, *in-vitro* platelet aggregation	DEP induced lung inflammation (18 h), systemic inflammation, leucocytosis, increased IL-6, decreased BP, decreased SOD, reduced platelet counts, and aggravated thrombosis. Pretreatment with TQ prevented DEP-induced decrease in BP, leucocytosis, IL-6 changes, SOD activity, platelet loss, and thrombosis, but did not prevent platelet aggregation *in-vitro*.

TABLE 7: IMMUNOMODULATORY ACTIVITY [31-32]

S. no.	Extract / Treatment	Experimental Model	Parameters Studied	Key Findings
1	Aqueous extract	BALB/c and C57BL/6 splenocytes, macrophages, NK cells	Splenocyte proliferation, Th1/Th2 cytokines, IL-6, TNF-α, NO, NK cytotoxicity	Enhanced splenocyte proliferation, favored Th2 cytokines, suppressed pro-inflammatory mediators, increased NK cytotoxic activity against YAC-1 tumor cells.
2	Methanolic extract	BALB/c mice	WBC count, bone marrow cellularity, spleen weight, resistance to *Candida albicans*	Increased WBC count (up to 1.2×10^4 cells/mm³), bone marrow cellularity, spleen weight; restored resistance to lethal infection in immunosuppressed mice.
3	Volatile oil of seeds	Long-Evans rats	Antibody production, splenocyte, neutrophil, lymphocyte, monocyte counts	Decreased antibody response (~2-fold), decreased splenocyte and neutrophil counts, increased peripheral lymphocytes and monocytes; potential immunosuppressive cytotoxic activity.
4	Black seed co-	Pigeons	Leukocyte and	Completely blocked immunosuppressive

	administered with oxytetracycline		lymphocyte counts, H:L ratio, lysosomal activity, RES function	effects of oxytetracycline and produced immunostimulant effects.
5	Thymoquinone (TQ)	EAE mice (model of multiple sclerosis)	Disease prevention and cure	~90% preventive and 50% curative in chronic relapsing EAE via antioxidant effects.
6	*N. sativa* oil	Rats exposed to whole-body gamma irradiation	Hemolysin antibody titers, oxidative stress	Significantly reversed immunosuppressive and oxidative effects; radioprotective.
7	Aqueous extract	Ovalbumin-sensitized guinea pigs	Lung pathology, IL-4, IFN-γ	Reduced lung inflammation and pathology; increased IFN-γ, confirming preventive effect on airway inflammation.

TABLE 8: GASTRO-PROTECTIVE ACTIVITY [33-34]

S. no.	Extract / Treatment	Experimental Model	Parameters Studied	Key Findings
1	Thymoquinone (TQ)	Rats, pyloric ligation + ischemia/reperfusion	Gastric acid secretion, acid output, pepsin, lipid peroxides, proton pump, myeloperoxidase, ulcer index, gastric mucin, GSH, NO, SOD	TQ (10–20 mg/kg) reduced acid secretion, pepsin, proton pump activity, neutrophil infiltration, lipid peroxidation, and ulcer index; increased mucin, GSH, NO, and SOD. Low-dose combinations additive to high dose effect. Mechanism: antioxidant + inhibition of acid secretion + enhanced mucin and NO.
2	Aqueous suspension of *N. sativa* seeds	Wistar albino rats, chemically induced ulcers (ethanol, NaOH, NaCl, indomethacin) and pylorus ligation	Ulcer formation/severity, basal gastric secretion, gastric wall mucus, non-protein sulfhydryl (NP-SH), histopathology	Significantly prevented ulcer formation, reduced ulcer severity and basal acid secretion, replenished mucus and NP-SH levels. Effect possibly mediated by prostaglandins, antioxidant, and anti-secretory activities.

TABLE 9: HEPATO-PROTECTIVE ACTIVITY [35-37]

S. no.	Extract / Treatment	Experimental Model	Parameters Studied	Key Findings
1	*N. sativa* (0.2 mL/kg, i.p.)	Rats, hepatic ischemia-reperfusion injury	Serum AST, ALT, LDH; hepatic TAC, CAT, TOS, OSI, MPO	Protected liver from ischemia-reperfusion injury; improved antioxidant status and reduced oxidative stress markers.
2	*N. sativa* administration	Rats exposed to toxic metals (lead) or chemicals (CCl_4)	Hepatic lipid peroxidation	Attenuated liver damage and lipid peroxidation induced by toxic metals or chemical hepatotoxins.
3	Thymoquinone (TQ, 10 µmol/L)	Swiss albino mice liver (*in-vitro*) treated with $CdCl_2$ (5 mmol/L)	Nonenzymatic and enzymatic antioxidants, protein carbonyl, reduced glutathione	Pretreatment with TQ prevented protein oxidation, restored depleted antioxidants, and protected against cadmium-induced hepatotoxicity.

TABLE 10: TOXICOLOGICAL STUDIES [38-40]

S. no.	Extract / Treatment	Experimental Model	Parameters Studied	Key Findings
1	*N. sativa* fixed oil	Mice (acute study, oral), Rats (chronic study, oral, 3 months)	Key hepatic enzymes (AST, ALT, GGT), histopathology of heart, liver, kidney, pancreas	No toxic effects observed; normal enzyme levels and tissue histology; demonstrates wide safety margin.
2	*N. sativa* fixed oil	Mice, single doses orally and intraperitoneally	LD50	Oral LD50: 26.2–31.6 g/kg; i.p. LD50: 1.86–2.26 g/kg; indicates low toxicity and high therapeutic safety.
3	Thymoquinone (TQ)	Mice	LD50 (i.p. and oral)	LD50: 104.7 mg/kg i.p., 870.9 mg/kg oral; 10–15× and 100–150× higher than therapeutic doses.
4	Thymoquinone (TQ)	Rats	LD50 (i.p. and oral)	LD_{50}: 57.5 mg/kg i.p., 794.3 mg/kg oral; confirms relative safety, especially *via* oral administration.

Cosmeceutical Application of *Nigella sativa*: The aromatic components of *Nigella sativa* seeds were shown to have potential use in cosmetic formulations in 2011. Because of their natural components, the seeds are beneficial for skin care and fragrance applications. *N. sativa* seed oil has a sun protection factor (SPF) value more than 2, which indicates a moderate degree of UV protection, according to additional study. Consequently, the oil can be used to cosmetics as a natural ingredient with potential skin-care and preventive properties **Table 11.**

TABLE 11: SOME COMMERCIAL PRODUCTS CONTAINING *NIGELLA SATIVA* EXTRACT [41-42]

Name of Product	Company	Use	Dosage/Form
Al Barakah	Shiffa Home	Increasing immunity and maintaining good health	Soft gelatin capsule
Black Seed Cream	Hemani	Helps in relaxation	Cream
Black seed Soap	Hemani	Body soap cleaner	Soap
Immuno-Viva Core	Immuno-Viva	Natural antioxidant supplement	Capsule and liquid form
Nigella sativa Cream	Bergmeister	Skin cream	Cream
Vatika Naturals Black Seed Enriched Hair Oil Complete Hair Care	Vatika Nature	Complete hair care, improved shine, texture, and volume, and reduced hair problems	Oil
Vatika Black Seed Hair Mask	Vatika Nature	Hair mask	Cream
Vatika Black Seed Shampoo	Vatika Nature	Strong and shiny hair	Shampoo

CONCLUSION: The use of herbal medicines as supplemental remedies is widespread, and their appeal is only increasing on a global scale. *Nigella sativa* has shown exceptional pharmacological potential among them. According to research, its seeds, oil, extracts, and active ingredients especially alpha-hederin and thymoquinone (TQ) show notable *in-vitro* and *in-vivo* effectiveness against a range of disorders while being comparatively harmless.

These results demonstrate *N. sativa's* potential as a treatment for diseases linked to oxidative stress, metabolism, inflammation, and infections. To clarify the exact molecular pathways behind its actions, more research is required. TQ, alpha-hederin, and other bioactive components might be chemically modified to provide safer and more effective medications.

Combining components of *N. sativa* with already used chemotherapeutic drugs may also improve efficacy and aid in overcoming drug resistance. To optimize *N. sativa's* medicinal potential, future studies should concentrate on its cellular and molecular targets. The purpose of this review is to assist researchers in their preclinical and clinical studies of this miraculous plant.

ACKNOWLEDGEMENT: Nil

CONFLICT OF INTEREST: Nil

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How to cite this article:
Shankhdhar A, Sahai D and Kannojia P: *Nigella sativa*: a comprehensive review of its pharmacological and therapeutic properties. Int J Pharmacognosy 2026; 13(3): 184-93. doi link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.13(3).184-93.