Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 202-207 | ISSN:2251-6727

An Overview of Nigella Sativa's Medicinal Potential: A Magical Herb

Makrand V. Hire*[1], Sagar A. Kasar[1], Avinash B. Gangurde[1], Saurabh D. Nikam[1], Niketan N. Khairnar[1], Krushna S. Chavan[1]

[1]Department of Pharmaceutics, K.B.H.S.S. Trust Institute of Pharmacy Malegaon, Nashik, Maharashtra, India.

(Received: 07 January 2024 Revised: 12 February 2024 Accepted: 06 March 2024)

KEYWORDS

Nigella sativa oil, Microemulsion, Black seed oil, Antibacterial, Antimicrobial.

ABSTRACT:

Introduction: Worldwide, Nigella sativa, also well-known as (Black seed) is a widely utilized therapeutic herb. It is frequently utilized in many traditional medical systems, including the systems of Ayurveda, Siddha, and Unani. One of the most widely respected historically, medicinal seeds is Nigella sativa. This review's goal is to highlight how beneficial this amazing herb is for treating and preventing various illnesses; the prophet of God previously highlighted the plant's significance in this regard. Following a review of the scientific literature, the present review paper has attempted to address the constituents of the plant and some of its uses for humans; nevertheless, additional research is necessary to uncover all of the herb's possible uses. Nigella sativa sometimes recognized as black seed; it associates of the Ranunculaceae family. The plant features glossy green leaves and a slightly hairy stalk and pretty blooms near the stem's terminus. The flowers have a little blue or green tint at the tip, otherwise they are a milky white colour. Seedpods are three-edged, black, and slightly curved capsules that hold seeds. Plants of Nigella sativa reach maturity in a year and reach a height of one to two feet.

Objectives: The objective of this review is to provide a comprehensive overview of the medicinal potential of Nigella sativa, commonly known as black seed or black cumin, with a focus on its pharmacological properties, therapeutic applications, and potential health benefits. Through a synthesis of current research findings and historical uses, this review aims to elucidate the diverse range of bioactive compounds present in Nigella sativa and their effects on various physiological systems, thereby contributing to a deeper understanding of its therapeutic value and potential as a natural remedy for a wide array of health conditions.

Conclusions: Herbal medicine is a common supplemental therapy that is becoming more and more well-liked globally. While the majority of medications are synthetically modified natural compounds, several are obtained straight from plants. The possible application of Nigella S. seeds, oil, and extract in pharmaceutical contexts, together with a few of the active ingredients (especially TQ) or other constituents have been confirmed in the original research articles that have been published thus far. These substances have been found to be relatively safe and to possess remarkable pharmacological activities both in-vivo and in-vitro against a variety of illnesses.

1. Introduction

Nigella sativa sometimes recognized as black seed; it associates of the Ranunculaceae family. The plant features glossy green leaves and a slightly hairy stalk.*(1)* and pretty blooms near the stem's terminus. The flowers have a little blue or green tint at the tip, otherwise they are a milky white colour. Seedpods are three-edged, black, and slightly curved capsules that hold seeds. Plants of Nigella sativa reach maturity in a year and reach a height of one to two feet.*(2)* Additionally, the seeds present lipid rich oil that is characteristic of the genus 4,5 and is high in polyunsaturated fatty acid, primarily linoleic acid, oleic acid and eicodadienoic acid. Solid fats

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 202-207 | ISSN:2251-6727

make up roughly thirty percent. Nigella oil, sometimes known as "Black Seed" may also include TQ, the primary component that gives it its fragrant flavour.*(3)* For many ages, several indigenous medical systems and folk remedies have employed medicinal plants to treat illnesses. Furthermore, as they are safe than contemporary conventional medication, medicinal plants frequently utilized in the creation of herbal remedies. Since a small number of plant species have been fully examine for their potential, safety assessment, mechanism of action, and toxicological investigations, many researchers are concentrating on medicinal plants.*(4)*

2. Pharmacognostical properties

Plant morphology:

Nigella sativa grows to a height of twenty to ninety cm and blooms once a year. Its segments range from narrowly linear to threadlike, and its leaves are finely divided. The delicate flowers are coloured white or pale blue purple, and usually have 5 to 10 petals. Fruit consists of a big inflated capsule compose of three to seven interconnected follicles, contain several seeds.*(5)*

3. Chemical composition of black seeds

Numerous active chemicals found in several black seed kinds have been separated, recognized, and stated. Thymoquinone (TQ), α-pinene, carvacrol, terpineol, sesquiterpene longifolene, thymohydroquinone, dithymoquinone, and thymol, among other chemicals, are significant active elements. Nigella Sativa also contains trace amounts of other substances. Alkaloids found in seeds fall into two main categories: pyrazol alkaloids, also known as indazole ring carrying alkaloids, which include nigellidine, nigellicine and isoquinoline alkaloids, which contain nigellicimine and nigellicimine N-oxide. N. sativa seeds also contain the water-soluble pentacyclic triterpene alpha-hederin and saponin, a substance that may cause cancer.*(3)(6)*

Linoleic acid, oleic acid or eicodadienoic acid are the main unsaturated fatty acids, are said to be abundant in the seed fat oil. Saturated fats (stearic and palmitic acids) make up roughly thirty percent or less.*(7)(8)(9)*

4. Traditional uses of folk remedies

In addition to being used for general well-being, Historically, N. sativa is treated for medical purposes a wide range of illnesses and ailments linked to the breathing system, heart circulation, kidney and liver function, GI tract, and immunity function.*(4)*

5. Biochemical and pharmacological actions

Many researchers have conducted extensive studies on N. sativa using contemporary scientific methods because it is thought to be a magical herb that can treat a wide range of illnesses and problems. Over the past few decades, several pharmacological activities of Nigella sativa have been studied.

5.1. Anti-bacterial activity

Responsive to a 4 mg/disc ethanolic extract of Black seed with a minimal inhibitory level.*(10)* Triple treatment was utilized to get rid of the bacteria Helicobacter pylori in people with non-ulcer indigestion, and it was discovered that N. sativa has antimicrobial properties against those germs. Studies have shown that black seeds have therapeutically helpful anti-H. pylori efficacy that is similar to triple treatment.*(11)* On 11 human diseases, the antimicrobial properties and inhibitory biofilm potencies of TQ were assessed. In opposition to certain human infectious microorganisms, TQ shown a strong bactericidal action, particularly against Gram-positive cocci. TQ Constrained cell adherence to the surface of glass slides.*(12)*.

5.2 Anti-microbial effects

Excellent in vitro anti-bacterial activity of Nigella sativa ethanolic extract was demonstrated against both methicillin-resistant and sensitive strains of Staphylococcus aureus.*(13)* Nigella sativa inhibited the growth of pathogenic yeast, Germ high pathogens, and Gram neutral pathogens. Escherichia thyphimurium remained insensitive to the range of extract quantities used in the study. The extract demonstrated synergistic antibacterial activity with gentamycin and streptomycin. Studies conducted in vivo demonstrated that the diethyl ether extract effectively treated mice's localized Staphylococcus aureus infections.*(14)*

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 202-207 | ISSN:2251-6727

5.3 Anti-dermatophyte effects

One possible source of antidermatophyte medications is Nigella sativa. Eight species of dermatophytes were subjected to MICs produced by the seed's ether extract and its active ingredient, TQ. This validates its application in traditional medicine to treat fungal skin infections.*(15)*

5.4 Anti-oxidant effects

N. sativa extract in a solvent of CO2 *(16)* and the solvent, methanolic extract, has antioxidant properties.*(17)* Anti-oxidants available in Black seeds present selenium, DL-γ- and DL-α- tocopherol, all trans retinol, TQ & thymol.*(18)* Rats fed oxidized corn oil showed improvements in their overall antioxidant capacity when Nigella sativa was added to their diet. This was demonstrated by a significant decrease in RBC haemolysis as well as a reduction in the synthesis of the acid thiobarbituric and other reactive chemicals, which are signs of oxidative harm.*(19)* TQ, and the main constituents of N. sativa volatile oil, is in charge of the plant's anti-oxidative properties. TQ did not harm DNA, but it did decrease the iron-dependent microsomal lipid per oxidation.*(20)*.

5.5 Anti-inflammatory effects

Both arthritis and asthma are long-term inflammatory conditions that include several inflammatory mediators and distinct pathways. The rats paw inflammation and the weight of the tumour pouches decreased dramatically, and it was discovered that the fixed oil and TQ from the seeds inhibited the production of eicosanoid in leucocytes and membrane lipid peroxidation.*(21)* TQ's anti-inflammatory qualities are supported by its ability to decrease inflammation of the allergic airway by preventing cytokines associated with Th2, eosinophil penetration in the respiratory tract, and goblet cells proliferation.*(22)(23)*

5.6 Anti-convulsing effects

Thymoquinone may have anticonvulsant effects, most likely by raising GABAergic tone via the action of opioid receptors.*(24)* Nigella sativa oil application may be a viable strategy for stopping or preventing excitotoxic agent-induced seizures.*(25)*

5.7 Anti-hypertensive effects

Hypertensive, a condition linked to choices made in life, can be efficiently treated as well as prevented with changes to your diet. N. sativa extracts administration resulted in a dose-related lowering on both diastolic and systolic blood pressure levels. There were no reported side effects from NS 45 Nigella sativa: the miracle herb. According to the findings, patients with mild hypertension may experience a reduction in blood pressure after taking NS seed extract every day for a duration of a month.*(26)*.

5.8 Antidiabetic activity

A rat model of diabetes was used to assess curative potential of α-lipoic acid, L-carnitine & N. sativa alone or in combine in the metabolism of carbohydrates or fats. The model created by injecting 65 mg/kg of streptozocin (STZ) once intraperitoneally. To evaluate glucose metabolism, measurements were made of fasting blood sugar, sensitivity to insulin, HOMA, or C-peptide, and pyruvate activity. The increased blood glucose level was effectively lowered by either N. sativa or α-LA. The levels of C-peptide and insulin were considerably elevated by the combination of three substances. α-LA, the amino acid L- as well as N. sativa when used together may greatly enhance the way that carbohydrates are metabolized in diabetic rats, increasing the likelihood that DM will be successfully managed.*(27)*.

5.9 Anticancer activity

TQ is being studied in vitro to see if it can boost antigen-specific T cell existence or preserve the migratory sensor CD62L activity. The data, which also showed a significant mortality determined between three and five days after antigens activation or a reduction of CD62L surfaces expression, indicated the induction of OT-1 (transgenic CD+) T cell primed with OVA antigens. During CD85+ T-cell activation, the addition of modest doses of TQ led to increased T cell survival and prolonged CD62L expression. The outcomes were accompanied by an increase in CD8+ T cells' capacity to generate Interferon-gamma is an inhibitory cytokine. It is determined that TQ is helpful in in vitro T cell conditioning utilizing adaptive T-cell treatment in the fight against carcinoma and infections.*(28)* It has been found that various N. sativa extract have lethal effects on

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 202-207 | ISSN:2251-6727

human The breast carcinoma cells MCF-7 when used as an adjuvant therapy with doxorubicin. The oil extract of N. sativa has demonstrated to have a half-life of 2.720±0.232 milligrams per and to be carcinogenic to MCF-7 cells. On the other hand, at concentrations as high as roughly fifty mg per milliliter, its water-soluble extract showed signs of cytotoxic.*(29)*

5.10 Carminative effects

Although Nigella sativa seeds are carminative—that is facilitate digesting and the evacuation of gases from the GI tract and stomachs they have a very faint scent. They facilitate evacuation and peristalsis. According to reports, N. sativa is carminative in Egyptian traditional medicine.*(30)*

5.11 Gastro protective effects

Based on ulcer index values, N. sativa or TQ may protects the stomach epithelium from alcohol's harmful effects and promote ulceration repair. When rats were fed ethanol, there was a considerable increase in the amount of mast cells (MC) and gastrointestinal damage, confirming histomorphometrically the presence of gastric injury. The N.S treatment significantly lower the amount of gastrointestinal damage as well as the total amount of MC. Similar to NS, but to a lesser extent, the quantity of MC and the extent of intestinal ulcers were both reduced with TQ treatment. It was shown that rats fed ethanol had increased an enzyme known activity and antihistamine levels in their stomach tissues; these elevations were abolished by NS or TQ administration. The study's findings indicate that both medications, but especially NS, may be able to partially shield the stomach mucous from severe alcohol-related injury to the mucosa. These gastrointestinal benefits may be brought about by the medications' antiperoxidative, antioxidant, and antihistaminic properties.*(31)* The ability of N. sativa extracts to guard against ethanol-induced ulcers in rats has been demonstrated. Diarrhea can also be effectively treated with N. sativa.*(32)*

5.13 Effects on nervous system

Prior research has demonstrated that long-term exposure to toluene causes significant degenerative changes Within the frontal part of the brain's stem, and hippocampal regions. Research has demonstrated that Nigella sativa improves the morphology of toluene-induced degeneration in the cerebral cortex and the brain stem. Furthermore, mice treated with Nigella sativa did not exhibit any deformed nerve cells in the hippocampus. These findings suggest that Nigella sativa may have potential as a treatment for neurodegeneration in rats exposed to prolonged levels of toluene. The primary active ingredient of N. sativa, thymoquinone, has been shown benefits for dopamine neurons' neurological protection from Parkinson's illness symptoms.*(33)*

5.14 Anti-allergic effects

Nigella S. Oil was previously applied to treatment allergic illnesses, such as rhinitis caused by allergies, asthma of the lungs, and allergic eczema. It has been shown to be a successful adjuvant for the treatment of allergic diseases.*(34)*.

6. Conclusion

Herbal medicine is a common supplemental therapy that is becoming more and more well-liked globally. While the majority of medications are synthetically modified natural compounds, several are obtained straight from plants. The possible application of Nigella S. seeds, oil, and extract in pharmaceutical contexts, together with a few of the active ingredients (especially TQ) or other constituents have been confirmed in the original research articles that have been published thus far. These substances have been found to be relatively safe and to possess remarkable pharmacological activities both in-vivo and in-vitro against a variety of illnesses.

7. Future perspectives

To further understand how N. sativa or their elements work to deliver medicinal benefits, more research is needed. Alphahederin, TQ plus other elements found in N. sativa seed may undergo chemical changes in the future that will result in safer and more potent medications for the management of several ailments.

References:

1. Otles, C. N. & S. Chemical composition of Nigella sativa L . Seeds Chemical composition of Nigella sativa L . seeds. *Food Chemistry* **2014**, *8146*(December), 259–261.
2. Nadaf, N. H.; Gawade, S. S.; Muniv, A. S.; Waghmare, S. R.; Jadhav, D. B.; Sonawane, K. D. Exploring anti-yeast activity of Nigella sativa seed extracts.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 202-207 | ISSN:2251-6727

Industrial Crops and Products **2015**, *77*, 624–630. doi:10.1016/j.indcrop.2015.09.038.

3. Al-Jassir, M. S. Chemical composition and microflora of black cumin (Nigella sativa L.) seeds growing in Saudi Arabia. *Food Chemistry* **1992**, *45*(4), 239–242. doi:10.1016/0308-8146(92)90153-S.
4. Ahmad, A.; Husain, A.; Mujeeb, M.; Khan, S. A.; Najmi, A. K.; Siddique, N. A.; et al. A review on therapeutic potential of Nigella sativa: A miracle herb. *Asian Pacific Journal of Tropical Biomedicine* **2013**, *3*(5), 337–352. doi:10.1016/S2221-1691(13)60075-1.
5. Nasehi, P. Research Article Research Article. *Archives of Anesthesiology and Critical Care* **2018**, *4*(4), 527–534.
6. Atta-ur-Rahman; Malik, S.; Hasan, S. S.; Choudhary, M. I.; Ni, C. Z.; Clardy, J. Nigellidine - A new indazole alkaloid from the seeds of Nigella sativa. *Tetrahedron Letters* **1995**, *36*(12), 1993–1996. doi:10.1016/0040-4039(95)00210-4.
7. Cheikh-Rouhou, S.; Besbes, S.; Lognay, G.; Blecker, C.; Deroanne, C.; Attia, H. Sterol composition of black cumin (Nigella sativa L.) and Aleppo pine (Pinus halepensis Mill.) seed oils. *Journal of Food Composition and Analysis* **2008**, *21*(2), 162–168. doi:10.1016/j.jfca.2007.09.001.
8. Mehta, B. K.; Verma, M.; Gupta, M. Novel lipid constituents identified in seeds of Nigella sativa (Linn). *Journal of the Brazilian Chemical Society* **2008**, *19*(3), 458–462. doi:10.1590/S0103-50532008000300012.
9. Bourgou, S.; Ksouri, R.; Bellila, A.; Skandrani, I.; Falleh, H.; Marzouk, B. Phenolic composition and biological activities of Tunisian Nigella sativa L. shoots and roots. *Comptes Rendus - Biologies* **2008**, *331*(1), 48–55. doi:10.1016/j.crvi.2007.11.001.
10. Hannan, A.; Saleem, S.; Chaudhary, S.; Barkaat, M.; Arshad, M. U. Anti bacterial activity of Nigella sativa against clinical isolates of methicillin resistant Staphylococcus aureus. *Journal of Ayub Medical College, Abbottabad : JAMC* **2008**, *20*(3), 72–74.
11. Salem, E. M.; Yar, T.; Bamosa, A. O.; Al-Quorain, A.; Yasawy, M. I.; Alsulaiman, R. M.; et al. Comparative study of Nigella Sativa and triple therapy in eradication of Helicobacter Pylori in patients with non-ulcer dyspepsia. *Saudi Journal of Gastroenterology* **2010**, *16*(3), 207–214. doi:10.4103/1319-3767.65201.
12. S., V. T.; S., F.; B., H. M.; D., M. S. A review on therapeutic potential of Nigella sativa (kalonji) seeds. *Journal of Medicinal Plants Research* **2014**, *8*(3), 167–177. doi:10.5897/jmpr10.737.
13. Chaieb, K.; Kouidhi, B.; Jrah, H.; Mahdouani, K.; Bakhrouf, A. Antibacterial activity of Thymoquinone, an active principle of Nigella sativa and its potency to prevent bacterial biofilm formation. *BMC Complementary and Alternative Medicine* **2011**, *11*, 1–19. doi:10.1186/1472-6882-11-29.
14. Hanafy, M. S. M.; Hatem, M. E. Studies on the antimicrobial activity of Nigella sativa seed (black cumin). *Journal of Ethnopharmacology* **1991**, *34*(2–3), 275–278. doi:10.1016/0378-8741(91)90047-H.
15. Aboul-Ela, E. I. Cytogenetic studies on Nigella sativa seeds extract and thymoquinone on mouse cells infected with schistosomiasis using karyotyping. *Mutation Research - Genetic Toxicology and Environmental Mutagenesis* **2002**, *516*(1–2), 11–17. doi:10.1016/S1383-5718(01)00333-3.
16. Sharma, N. K.; Ahirwar, D.; Jhade, D.; Gupta, S. Medicinal and Phamacological Potential of Nigella sativa : A Review. *Ethnobotanical Review* **2009**, *13*, 1–8.
17. Kanter, M.; Coskun, O.; Uysal, H. The antioxidative and antihistaminic effect of Nigella sativa and its major constituent, thymoquinone on ethanol-induced gastric mucosal damage. *Archives of Toxicology* **2006**, *80*(4), 217–224. doi:10.1007/s00204-005-0037-1.
18. Badary, O. A.; Taha, R. A.; Gamal El-Din, A. M.; Abdel-Wahab, M. H. Thymoquinone is a potent superoxide anion scavenger. *Drug and Chemical Toxicology* **2003**, *26*(2), 87–98. doi:10.1081/DCT-120020404.
19. El-Saleh, S. C.; Al-Sagair, O. A.; Al-Khalaf, M. I. Thymoquinone and Nigella sativa oil protection against methionine-induced hyperhomocysteinemia in rats. *International Journal of Cardiology* **2004**, *93*(1), 19–23. doi:10.1016/S0167-5273(03)00108-6.
20. Al-Naggar, T. B.; Gómez-Serranillos, M. P.; Carretero, M. E.; Villar, A. M. Neuropharmacological activity of Nigella sativa L. extracts. *Journal of Ethnopharmacology* **2003**, *88*(1), 63–68. doi:10.1016/S0378-8741(03)00157-0.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(2), 202-207 | ISSN:2251-6727

21. D'Antuono, L. F.; Moretti, A.; Lovato, A. F. S. Seed yield, yield components, oil content and essential oil content and composition of Nigella sativa L. and Nigella damascena L. *Industrial Crops and Products* **2002**, *15*(1), 59–69. doi:10.1016/S0926-6690(01)00096-6.
22. Boskabady, M. H.; Shirmohammadi, B.; Jandaghi, P.; Kiani, S. effect of aqueous and macerated. **2004**, 1–19.
23. Isik, A. F.; Kati, I.; Bayram, I.; Ozbek, H. A new agent for treatment of acute respiratory distress syndrome: Thymoquinone. An experimental study in a rat model. *European Journal of Cardio-thoracic Surgery* **2005**, *28*(2), 301–305. doi:10.1016/j.ejcts.2005.04.012.
24. Ilhan, A.; Gurel, A.; Armutcu, F.; Kamisli, S.; Iraz, M. Antiepileptogenic and antioxidant effects of Nigella sativa oil against pentylenetetrazol-induced kindling in mice. *Neuropharmacology* **2005**, *49*(4), 456–464. doi:10.1016/j.neuropharm.2005.04.004.
25. Enomoto, S.; Asano, R.; Iwahori, Y.; Narui, T.; Okada, Y.; Singab, A. N. B.; et al. Hematological studies on black cumin oil from the seeds of Nigella sativa L. *Biological and Pharmaceutical Bulletin* **2001**, *24*(3), 307–310. doi:10.1248/bpb.24.307.
26. 28) Anti-hypertensive.pdf.
27. Salama, R. H. M. Hypoglycemic effect of lipoic Acid, carnitine and nigella sativa in diabetic rat model. *International journal of health sciences* **2011**, *5*(2), 126–134.
28. Mahmoud, S. S.; Torchilin, V. P. Hormetic/Cytotoxic Effects of Nigella sativa Seed Alcoholic and Aqueous Extracts on MCF-7 Breast Cancer Cells Alone or in Combination with Doxorubicin. *Cell Biochemistry and Biophysics* **2013**, *66*(3), 451–460. doi:10.1007/s12013-012-9493-4.
29. Salem, M. L.; Alenzi, F. Q.; Attia, W. Y. Thymoquinone, the active ingredient of Nigella sativa seeds, enhances survival and activity of antigen-specific CD8-positive T cells in vitro. *British Journal of Biomedical Science* **2011**, *68*(3), 131–137. doi:10.1080/09674845.2011.11730340.
30. Thippeswamy, N. B.; Naidu, K. A. Antioxidant potency of cumin varieties-cumin, black cumin and bitter cumin-on antioxidant systems. *European Food Research and Technology* **2005**, *220*(5–6), 472–476. doi:10.1007/s00217-004-1087-y.
31. Tools, A.; Help, D.; Pmc, E. encephalomyelitis via nitric oxide and other oxidative str. 1–2.
32. Kalus, U.; Pruss, A.; Bystron, J.; Jurecka, M.; Smekalova, A.; Lichius, J. J.; et al. Effect of Nigella sativa (Black Seed) on Subjective Feeling in Patients with Allergic Diseases. *Phytotherapy Research* **2003**, *17*(10), 1209–1214. doi:10.1002/ptr.1356.
33. Bano, F., Wajeeh, M., Baig, N., Naz, H., & Akhtar, N. Antiobesity , antihyperlipidemic and hypoglycemic effects of the aqueous extract of Nigella Sativa seeds (Kalongi). *Pak. J. Biochem. Mol. Biol.* **2009**, *42*(4), 136–140.
34. Dahri, A. H.; Chandiol, A. M.; Rahoo, A. A.; Memon, R. A. Effect of Nigella sativa (kalonji) on serum cholesterol of albino rats. *Journal of Ayub Medical College, Abbottabad : JAMC* **2005**, *17*(2), 72–74.