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NIGELLA SATIVA – SCIENTIFIC RATIONALE RELATED TO ITS THERAPEUTIC EFFECTS IN INFECTIOUS AND NON-INFECTIOUS AILMENTS

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Abstract

Since time immemorial *Nigella sativa* (black cumin) has been used to treat a variety of infectious and non-infectious ailments. Benefits of this highly useful herbal medicine are well documented in Islamic teachings. The Prophet Muhammad (PBUH) Hadith says, "Black cumin is the ultimate treatment for every ailment except death and aging." Modern drug discovery methodologies have isolated individual beneficial components of this product mainly water-insoluble component thymoquinone (TQ), and several others like sterols, saponins, alkaloids, fatty acids, and volatile oils. Both the crude formulation and black cumin seed oils have proved their efficacy in a variety of disorders including cancer, cardiovascular issues, diabetes, immunological ailments, neurological disorders (psychiatric and non-psychiatric), dysfunction of thyroid glands and other hormonal problems, gastric disorder and infertility issues besides rectifying sexual dysfunctions. Importantly, *Nigella sativa* exerts strong antimicrobial effects thus providing an opportunity to treat a variety of infectious diseases including viral infections like hepatitis, acquired immunodeficiency syndrome related ailments, including several others. This article provides state of the art scientific information associated with black cumin seed therapeutic benefits in the backdrop of its historical perspective.

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Dr. Mukhtar and Samantha Davis have produced this document for the betterment of society and humanity to ensure that natural healing will never die.

NIGELLA SATIVA, ALSO KNOWN AS BLACK CUMIN, BLACK SEED, KALONJI AND HABA AL BARAKAH



Introduction

Complementary and alternative medicine has received much prominence in the past few decades. Among the extensive list of alternative medicine, the Black cumin (*Nigella sativa*) has been used to treat a variety of ailments. People believe in this highly beneficial herb can be ascertained from the facts that ancient Egyptian consider black cumin as a treatment for almost every disease. This was based on its usage and proved therapeutic efficacies. *Nigella sativa*, besides its usage for curing disease historically, has also been described in the Bible as "curative black cumin" (Isaiah 28:25, 27 NKJV) [1]. The historical healing effects of black cumin have been further substantiated with a Hadith from Prophet Muhammad (PBUH) saying narrated in (Sahih Bukhari 7:591) that it is the remedy for every disease except death. Abdullah Ibn SinaBalkhi (IbniSina) mentioned in Western literature as Avicenna and recognized as the father of modern medicine described *Nigella* as "Canon of Medicine" [2]. With such

an impressive retrospect modern drug discovery practices undermined and never recognized the healing potential of this traditional remedy openly. There should have been substantial clinical trials for a variety of indications already having strong proof of concept retrospectivelyandincorporate the beneficial effects of this "Canon of Medicine" in modern medicine.

Although clinical utilization of *Nigella* along with modern drug discovery practices lagged, however, important data in the form of several scientific publicationsexist on evaluating the chemical composition of the *Nigella sativa* seeds. A variety of essential components have been isolated from the seeds; however, the one having most impressive pharmacological profile is fat-soluble thymoquinone (TQ). Majority of scientific research related to therapeutic potentials of black seed has been diverted to this single constituent, although others are still waiting for their characterization and pharmacological evaluations. Thymoquinone has shown its potential to treat several

infectious and non-infectious ailments. It is high time to think about other constituents of this beneficial herb also.

Several studies confirmed anticancer effects of thymoquinone against breast cancer[3] and its metastasis[4], pancreatic[5], liver[6], ovarian[7], gastric[8], cervical[9] and prostate[10]cancers. Besides these specific studies related to several types of cancers, the underlying molecular mechanisms relevant to anticancer effects have also been deciphered. Such a strong proof of concept necessitates the utilization of *Nigella sativa* in cancer treatments. Importantly, traditional treatments like chemotherapies, radiations, and surgical management are associated with damages to the cells in the peripheries of the cancerous mass. However, *Nigella sativa* being a dietary ingredient, is a safer alternative to use in cancer treatments.

Upon ingestion, TQ, the oil-soluble constituent of *Nigella* brings homeostasis within the body and regulates a variety of metabolic processes.

Its effect on normalizing insulin secretions from pancreatic beta-cells during higher blood glucose levels through the regulation of malonyl-CoA[11] prompted its usage in diabetes treatments. Several follow up scientific studies have provided strong evidence for the antidiabetic effects of TQ in a highly purified form including crude formulations of *Nigella sativa*. The results of TQ in ameliorating metabolic abnormalities associated with obesity and improving reproductive capability have opened the doors for its extensive utilization in metabolic and cardiovascular ailments [12].

The neuroprotective effects of TQ help treat a variety of neurodegenerative ailments. It has been reported that the neuroprotective effects of TQ or the crude formulation of *Nigella* are mediated through its antioxidant and anti-inflammatory properties [13]. Studies manifesting benefits with *Nigella* in protecting neurodegeneration in the central nervous system, attenuation of spinal cord ischemia-reperfusion injury shows its therapeutic effects in the peripheral nervous system also [14].

Besides above-described ailments, the benefits of *Nigella sativa* and its constituents have been documented in a variety of diseases. Keeping in view that scientific literature relevant to this highly beneficial herb, its pharmacological constituents TQ is sporadic, there is need to prepare comprehensive list of disease specific benefits.

This article summarizes a variety of ailments treatable with either *Nigella sativa* or its isolated constituents, besides relevant scientific studies showing definite proof of concept for the utilization of this remedy having empirical therapeutic evidence spanning over time immemorial, there is an urgent need that such literature should be systematically organized in a small treatise like this one.

Notably, in the current era, when people mainly get a majority of the information and decision making for their treatment by utilizing information communication technologies. Such publications set a paradigm for the people looking for accurate and scientific knowledge necessary for their health and quality of life.



Cancer and Black Cumin

Black cumin seeds are rich in a variety of ingredients. Among several few have unique anticancer effects. A set of four interrelated compounds thymoquinone (TQ), dithymoquinone (DTQ), thymohydroquinone (THQ), and thymol (THY), are mainly present in oils extracted from *N. sativa* seeds. Although all these four compounds are interrelated, however, TQ has shown relatively higher anticancer effects. The exact mechanism of controlling cancer by the TQ is not well known; however, it has several beneficial properties contributing to cancer control in the

human body. For example, the potent antioxidant and anti-mutagenic properties of the TQ are incredibly helpful in cancer control. Pre-clinical studies have shown that liver cancer is preceded with the oxidative stress and TQ supplementation impeded conditions in the living organisms that promote oxidative stress [15].

A recent review article summarizes several mechanisms through which TQ exhibit anticancer effects. The most prominent are the induction of apoptosis (death) of cancer cells, stopping cancer to grow and the generation of reactive oxygen species primarily concerned with the initiation of cancer.

Worth mentioning here are the two essential properties of the TQ, i.e., enhancing the immune system necessary for cancer control and ameliorating side effects of several chemotherapies regimen [16]. This and several other studies provide an impressive proof of concept in utilizing black cumin either in the crude formulation or its oil preparations to treat cancer. Several types of cancer are due to excessive mutations in the genetic material of human cells within the body.

The anti-mutations effects of TQ help in controlling a variety of cancers[17]. Excessive mutations in the genetic material of human cells mainly contribute towards the induction as well as the progression of cancer [18, 19]. Fortunately, *Nigella* is potent anti-mutagenic thus providing an opportunity to control cancer due to excessive mutations.

There are several types of cancers each and everyone associated with the abnormal proliferation of cells. The *Nigella sativa* and its components have proved their efficacy in almost every cancer type. Highly convincing scientific studies suggest that black cumin is effective in controlling various kinds of cancers involving blood systems, liver, kidney, lung, breast, cervix, and skin [20]. Importantly, the safety profile of *Nigella* is very high as it is an approved dietary ingredient paving the ways for

utilizing this beneficial herbal preparation in the treatment for cancers.



Black Cumin Miraculous Treatment for Diabetes

There are several antidiabetic medicines used for the treatment of people having diabetes. A patient suffering from either type 1 or 2 diabetes must continuously stay on medication; otherwise, blood glucose levels start to fluctuate.

A natural treatment/dietary ingredient stabilizing blood glucose levels can be a better choice when compared with traditional therapies with medicine or externally supplied insulin. The black seed offers this unique property and has shown its antidiabetic characteristics documented through a variety of scientific studies. Dose escalation studies show that administering 2 gm/day of *Nigella sativa* benefit people suffering from type 2 diabetes [21]. The *Nigella sativa* is quite safe to consume, and as such long-term usage is not harmful.

A longitudinal study spanning over 12 months evaluated the effects of conventional antidiabetic agents along with *Nigella sativa*. Intriguing results of this study supported the notion that patients' groups receiving *Nigella sativa* + antidiabetic medication regained their body glucose control when compared with individuals taking oral antidiabetics alone [22]. Such scientific information strongly suggests that *Nigella sativa* individually or in combination with other formulations brings significant benefits in improving the quality of life among people who have type 2 diabetes.

Type 1 diabetes is relatively different than type 2 in which the underlying cause is impaired production of insulin hormone among the people suffering from this disease. Besides several others, a preclinical study manifested that *Nigella sativa* beneficial properties in type 1 diabetes is due to its protective effects on the islet of Langerhans – cells in

the pancreas involved with insulin secretion[23]. The protective effects on insulin-producing cells in the pancreas are ultimately reflected in the form of enhanced insulin-secreting required to control type 1 diabetes. The regenerative effects of black seeds are a more natural and effective treatment when compared with conventional medications due to adverse events associated with every chemical formulation.

The benefits of *Nigella sativa* in controlling metabolic diseases like diabetes are well pronounced. Several human clinical trials have also shown the highly beneficial effect of this natural product in regulating blood sugar and insulin resistance syndrome associated with diabetes [21, 24].

Nigella in Neurological Ailments

The most prominent pharmacological component TQ has shown its strong potentials to treat neurological ailments, including neuroinflammatory disorders, neurodegeneration as well as psychiatric illnesses. A brief of TQ therapeutic effect in neurological ailments is described as below:

Alzheimer's disease (AD)

Alzheimer's disease is neurodegenerative, and individuals after the age of 60 and above are the primary victim of this ailment. Scientific studies suggest that TQ mainly present in the oily fraction of the *Nigella sativa* has therapeutic effects in AD. In a representative model of Alzheimer, TQ treatment reduced neurotoxicity the underlying cause of neurodegeneration associated with AD.

Importantly reduced neurotoxicity led to better synaptic activities required for proper transmission of a message by the brain [25]. People suffering from AD have prominent symptoms of learning and memory impairments. A study showing the benefits of TQ to overcome these neurological problems via enhancing levels of biological molecules like cytokines and reducing oxidative stress modulators amply support its benefits in overcoming Alzheimer's disease [26].

Parkinson's disease (PD)

The TQ mediated neuroprotection has been proven through several studies of PD model. Although both AD and PD are neurodegenerative, however, the pathological aspects differ

significantly in both these neurodegenerative diseases. The Parkinsonians individuals have a loss of dopaminergic neurons, mainly in specific regions of the brain like substantia nigra pars compacta. The anti-Parkinson's effects of the ethanolic extract of *Nigella sativa* seeds were manifested through reducing lipid peroxidation in the brain and controlling higher levels of toxic proteins observed in people suffering from the PD [27]. This was associated with the regeneration of neuronal and their dendritic processes for proper synaptic activity.

Controlling Schizophrenia Symptoms with Nigella

The effect of TQ in combating schizophrenia has also been documented. Furthermore, in the pre-clinical model, TQ individually or in combination with other medication, overcome cognitive impairment as well as symptoms linked with this disorder[28].

Nigella sativa– Treatment for sexual dysfunctions

Aging women mainly suffer from hormonal changes during menopause leading to sexual dysfunction. An intriguing study conducted on Iranian women suggested that *Nigella sativa* is useful to overcome sexual dysfunction among women during menopausal stages [29]. There are several other scientific information available in the public domain, suggesting that *Nigella* is beneficial in rectifying sexual dysfunctionalities among women.

Preclinical data regarding the effects of *Nigella sativa* to overcome infertility problems is quite intriguing. A study compared the results of the oral administration of the fixed oil of *Nigella* on male infertility in normal and hyperlipidemic preclinical model. Treatment outcomes suggested that *Nigella sativa* oil exhibited lipid-lowering effects in the hyperlipidemic animals. However, there were significant improvements in testosterone levels, sperm mobility, and total sperm count, mainly considered as fertility index [30].

Overall, this study concluded that *Nigella sativa* fixed oil has a beneficial effect in improving reproductive efficiency. Data presented in the 1st International Conference on Tropical Studies and Its Applications proved that *Nigella sativa* seeds extract enhance penile erection simulating

normal physiological mechanisms[31]. Erection in normal males is associated with the relaxation of blood vessels in the corpus cavernosum area of the male reproductive system. The black seeds exhibited highly reproducible effects on the relaxation of blood vessels requisite for erection necessary for further transfer of semen to the female reproductive system.

Worth mentioning over here is that the majority of males have problems related to relaxation of blood vessels the underlying cause of infertility. A very robust review article accumulated all scientific information published during the fifteen years (2010- 2014) related to beneficial effects of black seed (*Nigella sativa*) in overcoming male infertility problems. The accumulated data collected from well-reputed databases and patents revealed that *Nigella* is quite helpful in overcoming infertility problems as fertility aspects related to men involve quality of semen, sexual hormones and the overall reproductive system health including Leydig cells – cells producing male hormones testosterone.

The data revealed that thymoquinone oil soluble fractions of the *Nigella sativa* and crude formulations are most promising in overcoming male infertility. The study concludes with recommendations for clinical trials, so the benefits of *Nigella* and its constituents can be scientifically acknowledged and approved across the world. Importantly, improvement in various aspects related to male fertility is mainly linked with the antioxidative potentials of *Nigella* [32]. Based on the present information, it is crucial to utilize *Nigella* formulation in curing reproductive health problems, particularly infertility.

***Nigella* ameliorates Gastrointestinal ailments**

In gastrointestinal ailments, there are several organs, including the stomach, small intestine, large intestine, liver, gall bladder, and pancreas that can have malfunctions. Scientific studies have reported benefits of *Nigella* in a variety of gastric ailments; however, we will describe remedial effects of *Nigella* in gastric cancers, hepatoprotective effects, antibacterial and anti-parasitic mainly (anti-schistosomiasis effects), besides beneficial anti-inflammatory and antioxidant effects in the

gastrointestinal tract. It has been reported that TQ actively stops cancerous growth of colon cancer cells through inducing programmed cell death [33]. Furthermore, TQ also inhibited the growth of pancreatic cancer cell line in the *in vitro* environments [34].

Preclinical findings from several scientific studies showing the hepatoprotective effects of *Nigella sativa* and its constituents. The black seed-mediated hepatoprotection involves controlling levels of various biomarkers in the body fluids, including serum aspartate aminotransferase, alanine aminotransferase, total antioxidant capacity, and oxidative stress index [35]. Oral administration of TQ (10mg/kg) normalized hepato-renal dysfunction in the rodent model studies [36].

Orally administrated *Nigella sativa* oil led to stopping reproduction of parasitic worm, *S. mansoni* in the liver besides lowering the number of ova in the intestine and liver. This schistosomicidal effect of *Nigella* is beneficial in controlling the worm infection that is hard to treat in several tropical parts of the world [37]. Besides these benefits of *Nigella* has also been described in controlling gastric ulcers and stomach disturbances as there are generalized benefits of *Nigella* in the gastric ailments.

Controlling Cardiovascular Ailments with Black seeds

The cardioprotective effects of black seeds have reported relatively higher than other diseases. Majority of the cardiac disorders are linked with dysregulation of lipid profile. It has been reported that thymoquinone lowers levels of various biomolecules associated with heart diseases pathogenesis.

Most prominent is a reduction in total cholesterol levels, triglycerides the building blocks of fats molecules and low-density lipoprotein (LDL) cholesterol [38] considered as dangerous due to its capability to make a deposit in blood vessel walls thus hindering proper blood flow. A study compared the effects of cholesterol depleting drugs stains and black seed powder and oil in the rabbit animal model. Results revealed that feeding rabbit with either formulation of *Nigella* crude extract or oil helped in regaining healthy lipid profile over a time span of 2 – 8 weeks [39].

Although TQ has shown its therapeutic potential individually, however, in treatment of cardiovascular ailments, crude preparation of *Nigella sativa* is considered superior when compared with oil extract. It is presumed that Nigella mediated hypolipidemic effect involve a synergy of TQ with other components like flavonoids and several polyunsaturated fatty acids abundantly present in Nigella seeds [40].

Rejuvenating Human Body Immunity with Black Seeds

Human body immune system protects against an ailment, and a variety of cellular and humoral components contributes towards the immunity. Both the oil and several other ingredients of black seed possess strong immunomodulatory effect[41]. Importantly, this immunomodulation is mediated through a group of immune cells known as T cell through natural killer cell-mediated immunity.

The beneficial effects of black seed on reversing immunological changes associated with the pathogenesis of the disease are quite intriguing. A study evaluated the beneficial effects of *Nigella sativa* in the animal model, having lung injury. Immune associated pathological changes and elevated immunological markers were reduced in asthma model by treatment with *Nigella sativa* [42]. A strong immunomodulatory effect of Nigella and its preparations also is helpful to recover fast from a variety of ailments.



Thyroid Disorders are treatable with Nigella

Several scientific studies convincingly support the role of *Nigella sativa* towards improving thyroid functions. In Hashimoto's thyroiditis, it has been observed that Nigella

overcome the disease and normalization of thyroid function by reducing vascular endothelial growth factor (VEGF) [43]. Furthermore, it has also been observed that Nigella treatment lowers serum levels of thyroid-stimulating hormone (TSH). This property of Nigella is quite helpful to treat a variety of thyroid disorders, and associated abnormalities like increase in body weight/ body mass index.

Hepatitis Control with Nigella

Nigella sativa is considered a highly beneficial traditional medicine to hepatitis. To understand better about the health promoting properties of Nigella, it is essential to review the underlying causes of hepatitis. The most prominent are: i) hepatitis due to viral infections, ii) autoimmunity mediated hepatitis and iii) toxicity of certain medications, including hepatitis.

As the anti-inflammatory and antioxidant potentials of Nigella are well documented as such both the crude formulations, and an oil-soluble fraction of this highly beneficial herb seeds have liver protective effects. An elaborate review discussing the mechanisms involved related to TQ mediated liver protection ponders on a variety of mechanisms based on available existing literature. The most prominent are elevating the natural antioxidant machinery of the human body like total thiol contents and glutathione levels, activating a variety of beneficial enzymes like catalase, quinone reductase, glutathione transferase and reducing pro-inflammatory biomolecules like NF- κ B including a reduction in the levels of cyclooxygenase and lipoxygenase that promotes liver injury[44].

It is important to discuss here the role of *Nigella sativa* in controlling viral hepatitis. Besides repairing liver damages through natural means, Nigella reduces the underlying causes like controlling the growth of hepatitis causing viruses. There are hundreds of scientific studies and empirical evidence related to antiviral effects of Nigella not only to treat hepatitis causing viral disease; instead, it is beneficial for controlling several other microbial infections

also. However, to stay focused here a few important scientific studies supporting the idea of controlling viral infections with *Nigella* are discussed below:

An herbal formulation of *Nigella sativa* named Alpha-zam specifically showed its inhibitory effects on the replication of the hepatitis C virus (HCV) [45]. Intriguing observation of this study is that the majority of the viral infections are controlled through inducing antiviral interferons; however, the *Nigella* preparation is quite different, although the exact molecular mechanisms are yet to be evaluated. *Nigella sativa* preparations also exhibited strong antiviral effects against other hepatitis, causing viruses. A study confirmed anti-hepatitis virus B effects of *Nigella* besides several others.



Conclusions

Based on the wealth of information related to therapeutic effects of *Nigella sativa* and its preparation there is a strong need that public should be made aware about the historical perspective of *Nigella sativa* in curing a variety of ailments. This article has accumulated a wealth of scientific information related to the topic for enhancing public science literacy for *Nigella* and its role in treating a variety of ailments.

Fortunately, *Nigella* is recognized as a safer formulation by the drug regulatory authorities across the world. Last but not least, it is vital to procure pure formulation from the

experts having sound knowledge relevant to the characterization of this beneficial herb and its formulations.



WHICH BLACK SEED OIL DO I RECOMMEND?

The oil I recommend always [is this oil](#). Testimony after testimony have proven Perfect Press to be best.

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