

***Nigella sativa*: the miraculous herb**

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Abstract: *Nigella sativa* is one of the most the most revered medicinal seeds in history. The objective of this review is to emphasize the effectiveness and uses in the prevention and treatment of a number of diseases by this miraculous herb, whose importance has already been mentioned by the holy prophet. After literature survey, this review article has made an attempt to encompass its composition and some of its uses for mankind and the herb need to be further explored to reveal more of its potential uses. Nigella Sativa, beneficial effects.

Keywords: *Nigella sativa*, black cumin seeds, miraculous herb, medicinal seeds.

Received: May 28, 2010 **Accepted:** November 14, 2010

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INTRODUCTION

Nigella sativa is one the most revered medicinal seeds in history. In Arabic it is called as Habba sawada. The best seeds come from Egypt where they grow under almost perfect conditions. Black cumin seeds were found in the tomb of Tutankhamun. It is narrated by Abu hurairah, the Prophet MOHAMMAD (Peace be Upon Him) said: "Use this Black seed; it has a cure for every disease except death"(Sahih Bukhari).

Black cumin seeds are also mentioned in the Bible. The seeds of *Nigella sativa* Linn. (Ranunculaceae), commonly known as black seed or black cumin, are used in folk (herbal) medicine all over the world for the treatment and prevention of a number of diseases. *N. sativa* is characterized by an erect branched stem and alternate finely divided, feathery, grayish-green leaves. The bluish-white, star-shaped flowers are terminal and solitary. Petals are absent. The plant is cultivated in India, Bangladesh, Turkey, Middle-east and the Mediterranean basin mainly for its seeds or "black cumin" which is almost entirely used for edible such as spices and medical purposes. The ripe seeds of *N. sativa*, also known as Kalajira or Kalaonji, are known to have a wide range of medicinal uses^{1,2}.

Chemical constituents of *Nigella sativa*

The seeds contain numerous esters of structurally unusual unsaturated fatty acids with terpene alcohols (7%); furthermore, traces of alkaloids are found which belong to two different types: isochinoline alkaloids are represented by nigellimin and nigellimin-N-oxide, and pyrazol alkaloids include nigellidin and nigellicin. In the essential oil (average. 0.5%, max. 1.5%), thymoquinone was identified as the main component (up to 50%) besides p-cymene (40%), α -pinene (up to 15%), dithymoquinone and thymohydroquinone³. Other terpene derivatives were found only in trace amounts; Carvacrol, carvone, limonene, 4-terpineol,

and citronellol. Furthermore, the essential oil contains significant (10%) amounts of fatty acid ethyl esters. On storage, thymoquinone yields dithymoquinone and higher oligocondensation products (nigellone).

The seeds also contain a fatty oil rich in unsaturated fatty acids, mainly linoleic acid (50 – 60%), oleic acid (20%), eicodadienoic acid (3%) and dihomolinoleic acid (10%) which is characteristic for the genus^{4,5}. Saturated fatty acids (palmitic, stearic acid) amount to about 30% or less. Commercial nigella oil ("Black Seed Oil", "Black Cumin Oil") may also contain parts of the essential oil, mostly thymoquinone, by which it acquires an aromatic flavor.

The seeds contain carotene which is converted by the liver to vitamin A⁶. The *Nigella sativa* seeds are also a source of calcium, iron, and potassium⁷. Currently a new acetylated triterpene saponin (penta hydroxyl pentacyclic triterpene) has been isolated from *Nigella sativa*⁸.

Biochemical and pharmacological actions

Carminative effects

Nigella sativa seeds have very little aroma but are carminative, meaning they tend to aid digestion and relieve gases in the stomach and intestines. They aid peristalsis and elimination. *N. sativa* has been reported to be used in Egyptian folk medicine as carminative⁹.

Anti-microbial effects

The ethanolic extract of *Nigella sativa* was shown to have outstanding in vitro antibacterial activity against methicillin resistant and sensitive strains of *Staphylococcus aureus*¹⁰. *Nigella sativa* inhibited growth of Gram-positive bacteria (*Staphylococcus aureus*), Gram-negative bacteria (*Escheria coli* and *Pseudomonas aeruginosa*) and a pathogenic yeast (*Candida albicans*)¹¹.

Salmonella thyphimurium was non-sensitive to the range of concentrations of the extract used in the study. The extract showed antibacterial synergism

with streptomycin and gentamycin. *In vivo* studies showed that the diethyl ether extract successfully eradicated localized infections of *Staphylococcus aureus* in mice¹¹.

Anti-dermatophyte effects

Nigella sativa is a potential source for antidermatophyte drugs. The ether extract of the seed and its active principle, thymoquinone produced minimum inhibitory concentrations (MICs) against 8 species of dermatophytes. This supports its use in folk medicine for the treatment of fungal skin infections.¹²

Anti-oxidant effects

Nigella sativa extract using CO₂ as the solvent¹³ and methanolic extract as the solvent possess anti-oxidant activity¹⁴. Antioxidants present in *Nigella sativa* seeds include selenium, DL- α - and DL- γ -tocopherol, all-trans retinol, thymoquinone and thymol¹⁵. Supplementation of the diet of rats fed oxidised corn oil with *Nigella sativa* led to an improvement in the overall antioxidant capacity as evidenced by a marked reduction in red blood cell haemolysis and plasma activities and a reduction in the formation of thiobarbituric acid reactive substances, indices of peroxidative damage¹⁶. The antioxidant effects are attributed to thymoquinone, a main constituent of the volatile oil of *Nigella sativa*. Thymoquinone inhibited iron-dependent microsomal lipid per oxidation but did not cause DNA damage¹⁷.

Anti-inflammatory effects

Asthma and arthritis are chronic inflammatory disorders involving a variety of inflammatory mediators and different pathways. The fixed oil and thymoquinone from the seeds were found to inhibit eicosanoid generation in leucocytes and membrane lipid per oxidation and a significant reduction in rat paw edema and a reduction in granuloma pouch weight were also observed.¹⁸ The anti-inflammatory effects of thymoquinone was supported by its ability to attenuate allergic airway inflammation by inhibiting Th₂ cytokines and eosinophil infiltration into the airways and goblet cell hyperplasia^{19,20}.

Analgesic and exploratory effects

The aqueous and methanolic extracts of *Nigella sativa* showed analgesic effect in mice as it produced significant increases in reaction times in the hot plate and pressure tests^{18,21}. Both extracts elicited depressant activity on exploratory conduct and reduced spontaneous motility in mice without causing failure of motor coordination. Both extracts also reduced the normal body temperature^{19,20}.

Antitumor effects

The oil and seed constituents of *N. sativa* showed anti-tumor effects *in vitro* and *in vivo*^{22, 23}. Given prophylactically to potassium bromated-

treated rats' elicited potent chemo preventive effects as evidenced by the suppression of hyper proliferative response, renal oxidative stress and toxicity²⁴. *Nigella sativa* also protected against ferric nitrotriacetate (Fe-NTA)-induced oxidative stress, hyper proliferative response and renal carcinogenesis in rats²⁵. The active principle of *Nigella sativa* seeds exhibited 50% cytotoxicity to Ehrlich ascites carcinoma, Dalton's lymphoma ascites and Sarcoma-180 cells with little activity against lymphocytes²⁶. The ethyl acetate fraction of *Nigella sativa* seed showed cytotoxicity against cancer cell lines. The anti-tumor effects of *Nigella sativa* oil was attributed to the volatile oil obtained from the seed, the major active components of which were thymoquinone and dithymoquinone^{27,28}. Thymoquinone killed cancer cells by a process that involved apoptosis and cell cycle arrest with little effect in non-cancerous cells²⁹.

Anti-convulsing effects

Thymoquinone may have anticonvulsant activity probably through an opioid receptor-mediated increase in GABAergic tone³⁰. The use of *Nigella sativa* oil could be a potential approach for arresting or inhibiting seizure genesis caused by excitotoxic agents³¹.

Immunomodulatory Effects

Nigella sativa does not seem to have immunomodulatory effect on T-helper 1 and T-helper 2 cells in response to allergen stimulation³². However, the extract inhibited human neutrophil elastase activity which was mainly attributed to carvacrol³³. The oil and certain active ingredients showed beneficial immunomodulatory properties, augmenting the T-cell and natural killer cell-mediated immune responses²².

Hematological effects

A methanolic extract of *Nigella sativa* showed inhibitory effects on arachidonic acid-induced platelet aggregation and on blood coagulation³⁴. The extracts appear to induce transient changes in the coagulation activity of rats³⁵. *Nigella sativa* also increased the depressed red and white blood cells count, the packed cell volume and neutrophil percentage³⁶. *Nigella sativa* oil may also play a role in modulating the balance of fibrinolysis/thrombus formation by modulating the fibrinolytic potential of endothelial cells^{37,38}.

Anti-hypertensive effects

Hypertension (HT) is a lifestyle-related disease and dietary modifications are effective for its management and prevention. *Nigella sativa* extract administration reduced both systolic blood pressure (SBP) and diastolic blood pressure (DBP) in a dose-dependent manner. No complications caused by NS

were observed. The results suggest that the daily use of NS seed extract for 2 months may have a blood pressure-lowering effect in patients with mild HT³⁹.

Gastro protective effects

Nigella sativa (NS) and its constituent, thymoquinone (TQ) could protect the gastric mucosa against the injurious effect of absolute alcohol and promote ulcer healing as evidenced from the ulcer index values. Gastric damage was confirmed histomorphometrically by significant increases in the number of mast cells (MC) and gastric erosions in ethanol treated rats.

The NS treatment significantly decreased the number of MC and reduced the area of gastric erosions. Likewise, TQ treatment was also able to reduce the number of MC and the gravity of gastric mucosal lesions, but to lesser extent compared to NS. Gastric tissue histamine levels and myeloperoxidase activities were found to be increased in ethanol treated rats, and NS or TQ treatment reversed these increases. Results obtained from this study suggest that both drugs, particularly NS could partly protect gastric mucosa from acute alcohol-induced mucosal injury, and these gastro protective effects could be due to their antiperoxidative, antioxidant and antihistaminic effects¹⁵.

Nigella sativa extract was proven to have a protective action against ethanol- induced ulcer in rats⁴⁰. *Nigella sativa* is also useful for treating diarrhea⁴¹.

Anti-asthmatic effects

The seeds of *Nigella sativa* have been used in traditional medicine for the treatment of a variety of diseases including asthma. Crude extract of *Nigella sativa* seeds exhibits spasmolytic and bronchodilator activities mediated possibly through calcium channel blockade and this activity is concentrated in the organic fraction. Its usefulness for asthma in traditional medicine, appears thus to be based on a sound mechanistic background⁴¹.

Protective effects against heavy metal toxicity

Heavy metals are widely distributed in the environment and some of them occur in food, water, air and tissues even in the absence of occupational exposure. Among of these lead, (Pb) is a hazardous substance to human and animals. The present study was carried out to investigate the possible protective effect of co-administered *Nigella sativa* seeds on lead acetate-induced rats toxicity in particularly on liver and kidney. Combined treatment of lead-exposed animals with *Nigella sativa* showed marked improvement in both biochemical and histopathological findings as well as reduction in the damaged areas. These experimental results strongly indicate the protective effect of *Nigella sativa*

against toxic effects of lead on liver and kidney tissues⁴².

Effects on nitric acid production

Reactive oxygen species (ROS) including nitric oxide (NO) are thought to be involved in inflammatory processes, exacerbating inflammation and tissue damage in multiple sclerosis (MS). Treatment with *N. sativa* inhibited ROS production induced by experimental autoimmune encephalomyelitis (EAE). In conclusion, *N sativa* may protect brain and medulla spinalis tissues against oxidative stress induced by EAE. In addition, *N. sativa* displayed its antioxidant and regulatory effects via inflammatory cells rather than the host tissue (brain and medulla spinalis) for EAE in rats⁴³.

Effects on nervous system

Previous studies have shown that chronic toluene exposure induces severe degenerative changes in the hippocampus, frontal cortex and brain stem⁴⁴. It has been shown that *Nigella sativa* causes morphological improvement on toluene induced neurodegeneration in the frontal cortex and brain stem⁴⁴ moreover the distorted nerve cells in the hippocampus were also absent in *Nigella sativa* treated rats thus *Nigella sativa* may indicate its usefulness as a potential treatment on neurodegeneration after chronic toluene exposure in rats⁴⁴.

Thymoquinone, the main active constituent of *Nigella sativa* has also shown to exhibit neuroprotective effects on dopaminergic neurons against Parkinson's diseases⁴⁵.

Anti-allergic effects

Allergic diseases (allergic rhinitis, bronchial asthma, atopic eczema) were treated with *Nigella sativa* oil and it is proved to be an effective adjuvant for the treatment of allergic diseases⁴⁶.

Cardiovascular effects

Yar and his coworkers had monitored the effect of *Nigella sativa* supplementation on cardiac reserve in rats. Their results showed that *Nigella sativa* generated homogenous cardiac hypertrophy similar to that provoked by exercise training. *Nigella sativa* treated animals also exhibited enhanced cardiac contractility at base line conduction⁴⁷.

Anti-diabetic effects

Apart from medication, exercise, herbs have been also used for treatment and management of hyperglycemia. *Nigella sativa* has been used as hypoglycemic agents. A plant mixture containing extracts of *Nigella sativa* possesses blood glucose lowering effects^{47,48}. The effect of *Nigella sativa* oil (NSO) on blood glucose concentrations was studied in streptozotocin diabetic rats. NSO significantly

lowered blood glucose concentrations in streptozotocin diabetic rats⁴⁹.

Anti-lipidemic effects

The effect of *Nigella sativa* on levels of cholesterol fractions was determined in the study on rats. A significant decrease in serum low density lipoprotein cholesterol level, and increase in serum high density lipoprotein cholesterol levels were observed^{50, 48}. Effect of *Nigella sativa* on triglycerides, total cholesterol, LDL and HDL cholesterol was also studied. A slight decrease in plasma triglycerides and a discrete increase in HDL cholesterol occurred.

Hypophagic and antiobesity effects

Studies conducted on water extract of *Nigella sativa* have shown to decrease body weight by suppressing appetite⁴⁸. The exact mechanism for the reduction of body weight is yet to be elucidated.

More and more beneficial effects of this miraculous herb should be explored in order to maximize its utility in effective treatment and cure for various diseases.

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