

## Medicinal and Pharmacological Potential of *Nigella sativa*: A Review

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### Abstract

Herbs are vital source of drugs from the ancient time holding the scenario of the Indian system of medicine. *Nigella sativa* commonly known as karayal is an annual flowering plant, native to southwest Asia. Seeds and their oil have a long history of folklore usage in various systems of medicines and are used in food as well as medicine. The present paper enumerates the medicinal, pharmacological, traditional value and folk remedies of this herb, which may help the researchers to set their minds for approaching the utility, efficacy and potency of *Nigella sativa*.

**Key Words:** *Nigella sativum*, Karayal, seeds, Pharmacological activities.

### Introduction

*N. sativa*, known as kalonji, black cumin is used as a spice in Indian and Middle Eastern cuisine. The dry roasted seeds flavor curries, vegetables and pulses. The black seeds taste like oregano and have bitterness to them like mustard-seeds. It can be used as a "pepper" in recipes with pod fruit, vegetables, salads and poultry.

*Nigella* is a genus of about 14 species of annual plants in the family Ranunculaceae, native to southern Europe, North Africa and Southwest Asia. Common names applied to members of this genus are Devil-in-a-bush or Love in a mist. The plant grows to 20-90 cm tall, with finely divided leaves, the leaf segments narrowly linear to threadlike. The flowers are white, yellow, pink, pale blue or pale purple, with 5-10 petals. The fruit is a capsule composed of several united follicles, each containing numerous seeds [1].

*Nigella sativa* commonly known as karayal (English: Small Fennel, Black Cumin; Sanskrit: Kalonji, Kalajira, Kalajaji, Mugrela, Upakuncika) is an annual flowering plant, native to southwest Asia. The plant is indigenous to the Mediterranean region but now found widely in India (Jammu, Kashmir, Himachal Pradesh, Bihar, Assam and Punjab). The herb is also cultivated in Bengal and north-east India. [2].

Several species are grown as ornamental plants in gardens, popular for their seed capsules, which are used in dried flower arrangements. Karayal are used exclusively for dried arrangements. The flowers are the best to add texture to any dried flower arrangement. The delicate purple striped pods are used in several arrangements for an airy effect.

### Scientific Classification [3]

Kingdom : Plantae

Division : Magnoliophyta

Order : Ranunculales

Family : Ranunculaceae

Genus : *Nigella*

Species : *sativa*

### Morphology

It is small prostrate annual herb about 45 cm high 2-3 slender leaves pinnatisect, 2-4 cm long cut into linear segment, segments oblong. Flowers pale, blue on solitary long peduncles, seeds trigonous and black in colour. The plant has a rather stiff, erect, branching stem, bears deeply-cut greyish-green leaves and terminal greyishblue flowers, followed by odd, toothed seed vessels, filled with small somewhat compressed seeds, usually three-cornered, with two sides flat and one convex, black or brown externally white and oleaginous, strong agreeable aromatic odour, like that of nutmegs, and a spicy, pungent taste. The flowers are delicate, and usually coloured pale blue and white, with 5-10 petals (Fig. 1). The fruit is a large and inflated capsule composed of 3-7 united follicles, each containing numerous seeds. It has a pungent bitter taste and a faint smell of strawberries [4, 5].

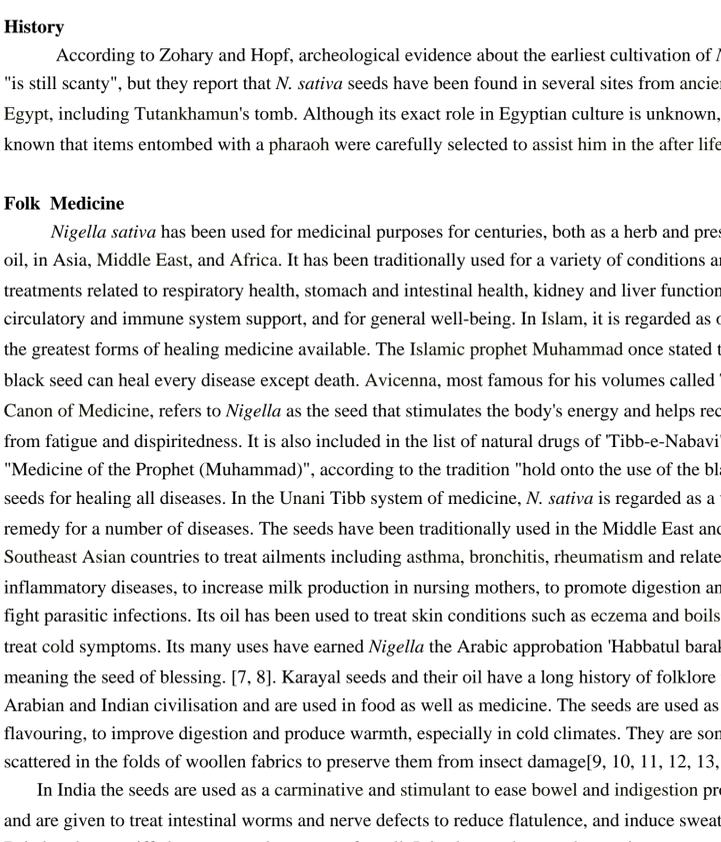


Fig 1. *Nigella sativa* (whole plant, Flower and seeds).

### History

According to Zohary and Hopf, archeological evidence about the earliest cultivation of *N. sativa* "is still scanty", but they report that *N. sativa* seeds have been found in several sites from ancient Egypt, including Tutankhamun's tomb. Although its exact role in Egyptian culture is unknown, it is known that items entombed with a pharaoh were carefully selected to assist him in the after life [6].

### Folk Medicine

*Nigella sativa* has been used for medicinal purposes for centuries, both as a herb and pressed into oil, in Asia, Middle East, and Africa. It has been traditionally used for a variety of conditions and treatments related to respiratory health, stomach and intestinal health, kidney and liver function, circulatory and immune system support, and for general well-being. In Islam, it is regarded as one of the greatest forms of healing medicine available. The Islamic prophet Muhammad once stated that the black seed can heal every disease except death. Avicenna, most famous for his volumes called The Canon of Medicine, refers to *Nigella* as the seed that stimulates the body's energy and helps recovery from fatigue and dispiritedness. It is also included in the list of natural drugs of 'Tibb-e-Nabavi', or "Medicine of the Prophet (Muhammad)", according to the tradition "hold onto the use of the black seeds for healing all diseases. In the Unani Tibb system of medicine, *N. sativa* is regarded as a valuable remedy for a number of diseases. The seeds have been traditionally used in the Middle East and Southeast Asian countries to treat ailments including asthma, bronchitis, rheumatism and related inflammatory diseases, to increase milk production in nursing mothers, to promote digestion and to fight parasitic infections. Its oil has been used to treat skin conditions such as eczema and boils and to treat cold symptoms. Its many uses have earned *Nigella* the Arabic approbation 'Habbatul barakah', meaning the seed of blessing. [7, 8]. Karayal seeds and their oil have a long history of folklore usage in Arabian and Indian civilisation and are used in food as well as medicine. The seeds are used as flavouring, to improve digestion and produce warmth, especially in cold climates. They are sometimes scattered in the folds of woollen fabrics to preserve them from insect damage[9, 10, 11, 12, 13, 14]. In India the seeds are used as a carminative and stimulant to ease bowel and indigestion problems and are given to treat intestinal worms and nerve defects to reduce flatulence, and induce sweating. Dried pods are sniffed to restore a lost sense of smell. It is also used to repel some insects, much like mothballs.

### Traditional Uses

Karayal seeds are used as a carminative, aromatic, stimulant, diuretic, anthelmintic, galactagogue and diaphoretic. They are used as a condiment in curries. A tincture prepared from the seeds is useful in indigestion, loss of appetite, diarrhoea, dropsy, amenorrhoea and dysmenorrhoea and in the treatment of worms and skin eruptions. Externally the oil is used as an antiseptic. To arrest vomiting, seeds are roasted and given internally.

### Chemical Composition [15, 16, 17, 18]

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 (avr. 0.5%, max. 1.5%), thymoquinone was identified as the main component (up to 50%) besides p-cymene (40%), pinene (up to 15%), dithymoquinone and thymohydroquinone. Other terpene derivatives were found only in trace amounts: Carvacrol, carvone, limonene, 4-terpineol, citronellol.

Furthermore, the essential oil contains significant (10%) amounts of fatty acid ethyl esters. On storage, thymoquinone yields dithymoquinone and higher oligocondensation products. The seeds also contain a fatty acid in unsaturated fatty acids, mainly linoleic acid (50-60%), oleic acid (20%), eicodadienoic acid (3%) and dihomolinoleic acid (10%).

Saturated fatty acids (palmitic, stearic acid) amount to about 30% or less. Also contain parts of the essential oil, mostly thymoquinone, by which it acquires an aromatic flavour. The seeds give on steam-distillation a yellowish brown volatile oil with an unpleasant odor. The oil contains carvone, d-limonene, and a carbonyl compound, nigellone.

### Pharmacology [19, 20,]

**1. Antimicrobial activity:** *Nigella sativa* exhibited strong antimicrobial activity against *Salmonella typhi*, *Pseudomonas aeruginosa* and others. The essential oil has been shown to have activity against Gram-positive and Gram-negative bacteria. However, sensitivity against Gram-positive bacteria such as *Staphylococcus aureus* and *Vibrio cholerae* was found to be stronger. Bacteria like *Staphylococcus aureus*, *S. pyogenes* and *S. viridans* are more susceptible to *Nigella sativa*. In an in-vitro study, volatile oil showed activity comparable to ampicillin. The activity of the volatile oil also extended to drug-resistant strains of *Shigella spp*, *Vibrio cholerae* and *Escherichia coli* and was found to have a synergistic action with streptomycin and gentamycin.

**2. Hepatoprotective activity:** Thymoquinone, one of the active constituents of *Nigella sativa*, is reported to have hepatoprotective activity." An in-vitro study showed the protective effect against tert-butyl hydroperoxide (TBHP)-induced oxidative damage to hepatocytes. The activity was demonstrated by a decreased leakage of alanine transaminase (ALT), aspartic transaminase (AST) and decreased trypan blue uptake.

**3. Antidiabetic activity:** Significant hypoglycaemic activity has been reported and is thought to be due to the essential oil present. Clinical studies have confirmed these results and suggest that the antidiabetic action of the plant extract.

**4. Antiinflammatory activity:** 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 peroxidation and a significant reduction in rat paw oedema and a reduction in granuloma pouch weight were also observed. Nigellone in low concentration is effective in inhibiting the histamine release from the mast cells, which supports an antiasthmatic role for the plant.

**5. Antifertility activity:** The antifertility activity of *Nigella sativa* in male rats has been established, shown by the inhibition of spermatogenesis and a significant reduction in testis acid content of the testis, epididymis, seminal vesicles and prostate.

**6. Antioxytotic activity:** Preliminary reports suggest antioxytotic properties, in that a reversible inhibition of spontaneous smooth muscle contraction and inhibition of uterine smooth muscle contraction induced by oxytocin stimulation have been observed.

**7. Cytotoxic activity:** Cytotoxic and immunopotentiating effects of *Nigella sativa* have been established. The long chain fatty acids are thought to contribute to the antitumour activity. The extract shows a modulatory effect in cisplatin-induced toxicity in mice and a protective effect against cisplatin-induced falls in haemoglobin levels and leucocyte counts.

**8. Anthelmintic activity:** *Nigella sativa* was found to have an anthelmintic activity against tapeworm comparable to that of piperazine.

**9. Analgesic activity:** The essential oil produced significant analgesic activity using chemical and thermal noxious stimuli methods such as acetic acid-induced writhing, hot plate and tail flick tests.

**10. Other activities:** Other reports include hypocholesterolaemic, antihypertensive and galactagogue effects.

### Indications and Usage [21]

*Nigella sativa* has been used for thousands of years in the Middle East for allergies, asthma, and for treating immune disorders. Recent research has shown that *Nigella sativa* increases the number of mammary cells in laboratory animals. Great research has been done on *Nigella sativa* in regards to its anti-cancer properties, especially breast cancer with promising results.

### Precautions and Adverse Reactions [22]

No health hazards or side effects are known with the proper administration of designated therapeutic dosages.

### Safety profile [22]

Seeds of *Nigella sativa* have a long history of use for food and medicinal purposes. No adverse or side effects have been reported when used within the recommended dosage, although dermatitis has been reported.

### Conclusion

Herbs are the natural drugs used to regain the alterations made in normal physiological system by foreign organisms or by any malfunctioning of the body. The WHO has already recognized the contribution of traditional health care in tribal communities. It is very essential to have a proper documentation of medicinal plants and to know their potential for the improvement of health and hygiene through an eco friendly system. Thus importance should be given to the potentiality of studies as these can provide a very effective strategy for the discovery of useful medicinally active identity. A detailed and systematic study is required for identification, cataloguing and knowledge of the plants, which may provide a meaningful way for the promotion of the traditional knowledge of the herbal medicinal plants. The present review reveals that *Nigella sativa* is used in treating various ailments. It elicits on all the aspects of the herb and throws the attention to set the mind of the researchers to carry out the work for developing its various formulations, which can ultimately be beneficial for the human beings as well as animals.

### References

1. New\_International\_Encyclopedia
2. Domestication of plants in the Old World (3 ed.). Oxford University Press. 2000.
3. Look for sterols at <http://glycoscience.org/glycoscience/linksPage/links.html>
4. Varghese E. SVD "Applied Ethnobotany- A case study among the Kharias of Central India", Deep Publications, New Delhi, (1996)
5. Dwivedi SN, Ethnobotanical studies and conservation strategies of wild and natural resources of Rewa district of Madhya Pradesh, *J. Econ. Tax. Bot.*, 27(1), 2003, 233-234.
6. Dwivedi SN, Herbal remedies among tribals of sidhi district of Madhya Pradesh, *J. Econ. Tax. Bot.* 2004, 675-686.
7. Dwivedi S *et. al.*, Revivance of medicinal herbs used in traditional system of medicine, Farmavita. Net, 2007.
8. Dwivedi, S.N. "Traditional health care among the tribals of Rewa District of Madhya Pradesh with special reference to conservation of endangered and vulnerable species", *Econ. Taxon. Bot.* (1999), 23(2): 315-320.
9. Dwivedi, S. N., Dwivedi, Sangeeta & Patel, P. C. "Medicinal Plants used by the tribals and rural people of Satna district, Madhya Pradesh for the treatment of gastrointestinal disease and disorders", *Nat. Pro. Rad.* (2006), 5(1): 60-63.
10. Dwivedi, Sumeet, Shrivastava, Satyaendra; Dubey, Darshan; Kapoor, Shweta & Jain, Sanjay "Status and conservation strategies of herbal oral contraceptives", *Planta Indica*, (2007)3(1): 5-7.
11. Kurion, J.C. "Plants that heals", 5th ed. Pune, Oriental watchman publishing house, (2003).
12. Khare, C.P. "Encyclopedia of Indian Medicinal Plants", Springes-Verlag Berlin Heidelberg, New York, (2004).
13. Sinha, R. K. "Tools of investigation. In Ethnobotany: The Renaissance of Traditional Herbal Medicine", INA Shree publication, Jaipur, (1998)
14. Dwivedi, Sumeet; Kaul, Shefali; Pandey, Deepak; Shrivastava, Satyaendra & Dwivedi, S.N. "Satus and conservation strategies of endangered and vulnerable medicinal plants", *Planta Indica*, (2007), 3(2): 13-15.
15. [www.botanical.com/botanical](http://www.botanical.com/botanical)
16. Chopra, 1958, 515, 568; Modi, 677; Schindler, 145; Rangaswami & Reichstein, *Helv. chim. acta*, 1949, 32, 939
17. Rittel & Reichstein, *ibid.*, 1954, 37, 1361
18. Rittel *et. al.*, *ibid.*, 1953, 36, 434; Pendse & Dutt, *Bull. Acad. Sci. Unit. Prov.*, 1933-34, 3, 209.
19. Chopra RN, Chopra IC, Handa KL, Kapoor LD, Chopra's Indigenous drug of India, U.N. Dhar & Sons Pvt. Ltd. Calcuta, 2nd ed. 1958
20. Satyanarayana *et. al.*, *Ind. J. Pharm.*, 1975, 37, 126.
21. <http://www.divineremedies.com/>
22. [http://www.uni-graz.at/~katzner/engl/generic\\_frame.html?Nige\\_sat.html](http://www.uni-graz.at/~katzner/engl/generic_frame.html?Nige_sat.html)