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ETHNOMEDICINAL SURVEY OF *NIGELLA SATIVA* L. (BLACK CUMIN/KALONJI) PLANT

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ABSTRACT

Nigella sativa L. is a well-known traditional herb, and for the present study, the plant is surveyed and collected from Rajgarh, Madhya Pradesh and Washim, Maharashtra. Its seeds are mainly used for medicinal purposes and are known by various names, such as Black Seed, Black Cumin, and Kalonji. Its cultivation is highly productive and cost-effective, but its medicinal value is exceptional. People use the oil and raw seed in their traditional style for disease management, with honey, milk, decoction, as spices, etc. From its aqueous to oil extract, the seeds have the potential to cure inflammation, microbial infection, constipation, cancer, diabetes, etc. In India, from Maharashtra to Punjab, Gujarat to Assam, the plant is cultivated, and people use it to cure illnesses traditionally and by modern methods in different ways.

KEYWORDS: Ethnomedicinal, *Nigella sativa* L., Thymoquinone, Bioactive compound.

INTRODUCTION

Because of the safe and cost-effective properties of herbal medicines and their gentle and nourishing effect, the plants are attracting the world for their exploration, mainly in medicine or clinical trials.[5]

***Figure 1*: Flower of *N. sativa*.**

Nigella sativa L. is a well-known traditional herb used to treat thousands of diseases[19] caused by biological and abiotic factors since people discovered its effects. From its aqueous to oil extract, the seeds have the potential to cure inflammation, microbial infections, constipation, cancer, diabetes, and other disease conditions. Throughout the world, its seeds are mainly used as medicine and are known by various names like habba-tu sawda (seed of blessing), black seed, black cumin, kalonji, shonaiz, kalajira, etc.[22] So far, numerous studies have analysed that the main active constituent, Thymoquinone of *N. sativa* seed, is very effective against numerous illnesses and is responsible for the reduction in carcinogenesis.[22] Its cultivation is so productive and cheap, but the medicinal value is at the top, from curing skin diseases to regulating internal body metabolism; the plant plays a dominant role. In India, from Maharashtra to Punjab, Gujarat to Assam, the plant is cultivated, and people use it to cure ill health traditionally and by modern methods in different ways. So many pharmacological effects are known, like anti-microbial effect, gastric ulcer healing, antioxidant properties, anti-inflammatory, antitumor effects, anti-helicobacter activity, etc.[19-22]

Nigella sativa L belongs to the family Ranunculaceae, is an annual flowering plant 20-90 cm in height with finely divided leaves and delicate flowers that have 5-10 petals (Fig. 1). Phytochemical components, which are bioactive constituents of plants such as phenol, tannin, flavonoid, glycoside, terpenoids, carbohydrates, steroids, protein and amino acids, are responsible for disease treatments.[2] Preliminary phytochemical analysis of seeds of *N. sativa* reveals the presence of phenol, flavonoid, alkaloid, glycoside, tannin, saponin, protein, etc.[13]

Figure 2: Seed of *Nigella sativa.*

Nowadays, because of its unlimited medicinal and disease-curing properties, *N. sativa* is attracting researchers to explore its importance and gathering attention by giving positive results in all aspects. The researchers are extracting the oil in different solvents like methanol, petroleum ether, ethyl acetate, etc. and studying the polarity and potential of the oil extract.[2] Despite this, a researcher discovered combined effects of *N. sativa* with other herbs like *Smilax china* and *Hemidesmus indicus*, in that they conclude, *N. sativa* showed a better cytotoxic effect compared to others.[21] So many anticancer activities of *N. sativa* because of its main phytoconstituent thymoquinon, is reported by researchers, including antiapoptotic activity, cytotoxic effect, and anti-proliferative effect, etc.[5] With this, *N. sativa* is also known for various airway disorders, chronic headache, hypertension, back pain, paralysis, etc.[23]

For this study, plants were surveyed and collected from Rajgarh, Madhya Pradesh, and Washim, Maharashtra. During the survey, we collected the plant parts and especially talked to the farmers & local tribes as they were cultivating *N. sativa* and exploring its traditional methods as medicine. A written literature is surveyed to understand the scientific research on the medicinal benefits of *N. sativa*.

MATERIAL AND METHOD

Study area

The field survey of *N. sativa* was conducted first at Rajgarh, Madhya Pradesh and next at Washim, Maharashtra. Rajgarh is located at an altitude of 390 m above sea level and extends between the parallels of Latitude 23 27′ 12″ North and 24 17′ 20″ north and between the meridians of Longitude 76 11′ 15″ and 77 14′ east. The total Geographical area of the District

is 6,154 sq.km. The Washim district, 4901.190 sq. km, is located with a latitude of 20 6′ 10.44″ North and longitude 77 8′ 53.0232″ east.

Figure 3: First visit. Rajgad, M.P. India.

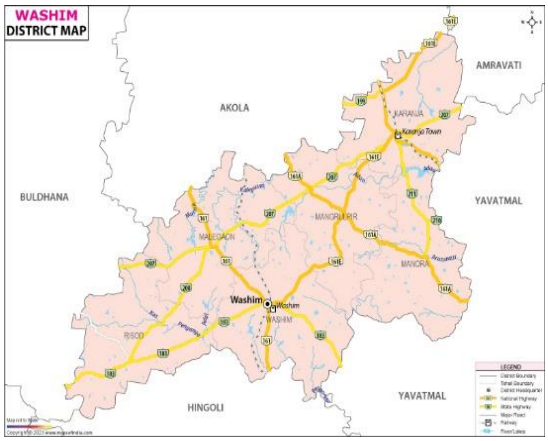

Figure 4: Second visit. Washim, M. H. India.

Ethnomedicinal study of *Nigella sativa* L.

The *Nigella sativa* L. is popularly known as kalonji or black seed in various regions of Maharashtra. The seed of *N. sativa* since century used in Ayurveda to treat diseases and infections. The Prophet of Islam, Mohammad (PBUH), described it as, "the black seed holds the remedy for every ill health except death."[23] The field survey of Rajgarh and Washim gave us a lot of information about its traditional uses. Despite the field survey, several literature reviews were also studied to get clarity about its uses and benefits by the scientific method. The population practising herbal remedies and medicine in disease management, as the high and regular chemical doses of drugs lead to kidney and lung failure. Because of this, people believe in herbal drugs.

Figure 5: Collection of *Nigella sativa.*

Figure 6: Field of *Nigella sativa.*

Phytochemicals of *Nigella sativa* L.

People have used the seed of *N. sativa* for centuries and believe that its strong spicy taste and smell have potential medicinal properties. The volatile oil of *N. sativa has been* attracting the world traditionally as well as in clinical research. Preliminary phytochemical analysis of seeds of *N. sativa* reveals the presence of phenol, flavonoid, alkaloid, glycoside, tannin, saponin, protein, etc.[13] The research finds that the main active compound (volatile oil) of *N. sativa* is Thymoquinone (TQ) (5-isopropyl-2-methyl-1, 4-benzoquinone).[4] Novel compounds, nigellicimine and nigellicimine n-oxide, a type of isoquinoline alkaloid and nigellidine and nigellicine, a pyrazol alkaloid, are discovered from the seeds of black cumin.[11] A study observed Nigellone (dithymoquinone), a bioactive compound, and its effect on asthma.[8]

As Spices

Worldwide, the seeds of *N. sativa* are popularly used as a flavouring agent, pungent appetiser, purgative stimulant, aromatic stimulant and thermogenic stimulant in recipes like pickle, salad, soups, spicy dishes, etc. The royal families use kalonji on a daily basis in mix with the mouth fresheners like fennel seeds, flaxseed, cardamom, carom seed, mukhwas, etc. and as spices. People believe that from their grandparents, the use of *N. sativa* can improve gut health and overall metabolism, as they used the seed and experienced its benefits.

In cancer

The people believe in the phytochemical content of *N. sativa* & use it to consume the decoction to cure cancer diseases. It's not a small thing that people are consuming it for cancer management. Empirically, it is consumed by making a seed decoction, oil and powdered material as a medicine.

There are a lot of reviews available on the chemical composition of *N. sativa*, which describes its potential to cure diseases. The compound 5-isopropyl-2-methyl-1, 4-benzoquinone is known as Thymoquinone (TQ), which is the major active component of *N. sativa* that exhibits anti-cancer activity.[4] The anti-cancer activity of *N. sativa* was checked on the breast cancer cell line (MCF7), and the complete inhibition of cells was monitored.[10] During the study of colon cancer inhibition, it was seen that the cancer cells were inhibited in the G1 phase of the cell cycle, and apoptosis was induced by thymoquinone.[14] The study on Pancreatic Carcinoma (PC) reveals that oxaliplatin-induced activation of NF kappa B leads to a pancreatic tumour, which is inhibited by thymoquinone.[6]

In fungal & bacterial infections

Because of the side effects of chemical antimicrobial drugs that are currently used, the population wants their replacement, so to fulfil this need a scientists and researchers are trying to explore more and more phytochemicals that can help in disease management. The decoction of the seed is consumed to treat bacterial and fungal infections related to digestion, skin, and overall metabolism. The fresh seeds of *N. sativa* are ground on a mortar pestle with a little amount of water, and then the paste is applied on the abscess to release pus from it.

The mechanism of antimicrobial activity of *N. sativa* has not been reported.[11] A study observed that the components of *N. sativa*, i.e. thymoquinone and thymohydroquinone, are effective in inhibiting the growth of the bacterium *Staphylococcus aureus*.[15] The production inhibition of Aflatoxin B1 by the fungus *Aspergillus parasiticus* (CBS 921.7) and *Aspergillus flavus* (SQU 21) strains was monitored by *N. sativa* seed oil. And the oil showed 47.9 and 58.3% inhibition for *A. flavus* and 32-48% for *A. parasiticus* strains.[9] *Candida albicans*, a colony-producing fungi in the kidney, liver and spleen of infected mice, was administered by giving aqueous extract of *N. sativa* seeds (6.6 ml/kg daily for 3 days). The experiment reveals the inhibitory effect of the extract on the pathogen.[12]

The antibacterial activity of *N. sativa* was analysed on 16 gram-negative and 6 gram-positive bacteria, and results showed that the crude alkaloid and water extracts are more effective and gram-negative bacteria are affected more than gram-positive.[18] The inhibition on gram-positive, *Staphylococcus aureus* and gram-negative, *Pseudomonas aeruginosa*, *Escherichia coli* and pathogenic yeast *Candida albicans* was observed, by the filter paper discs impregnated method of ethyl ether extract of *N. sativa* (25-400 micrograms/disc), the extract showed antibacterial synergism with streptomycin and gentamicin and exhibited an additive antibacterial action with doxycycline, spectinomycin, erythromycin, tobramycin, ampicillin, chloramphenicol, nalidixic acid, lincomycin and sulfamethoxazole trimethoprim combination.[16]

In a viral infection

In a research, the patient with hepatitis C virus (HCV) infection who were not eligible for IFN-α therapy, treated with the soft gelatine capsules of *N. sativa* seed oil (450 mg) for three successive months for three times in a day, and results showed the significantly decreased of the viral load also improvement of the oxidative stress due to augmented total antioxidant

activity, total protein and albumin, improved RBC and platelet counts in HCV patients and that all leads to reduce the incidence of haemolysis.[7]

In diabetes

As diabetes is one of the major cause of death, nowadays every home have at least one individual with diabetes. With the low-carb diet, people consume a spoonful of *N. sativa* seed oil daily in the morning to fight diabetes and get good results.

From the petroleum ether extract of the seed, the anti-diabetic activity is analysed, & the results revealed that the extract controls diabetes by controlling insulin release.[20]

As a blood purifier

A variety of herbal blood purifiers available in the market claim that they use *N. sativa* seed as an ingredient with other herbs in their tonic.

As antinociceptive

By the dose-dependent suppression, the antinociceptive effects of *N. sativa* seed oil (thymoquinone) are examined in mice, and finally, the results conclude that thymoquinone produces the nociceptive response by direct activation of supraspinal mu (1) - and kappa-opioid receptor subtypes.[1]

In Asthma treatment

The hot steam of water with 5 to 10 drops of *N. sativa* seed oil can improve respiratory health and the function of the lungs and throat. A pinch of seed powder with honey taken in the early morning can improve lung functioning and healthy skin.

The carbonyl dimer of thymoquinone, Nigellone (dithymoquinone), has been discovered to give relief in asthma conditions by inhibiting histamine secretion.[8] A clinical trial of boiled *N. sativa* seed extract was tested on asthmatic patients, and after treatment for three months, the pulmonary function test (PFT) improved.[24]

In worm infection

The infection of cestode worms in children was tested with a single oral administration of 40 mg/kg of ethanolic extract of *N. sativa*, and without any side effect, the faecal eggs percentage was diminished.[3]

For cultivation

The farmers who cultivate the *N. sativa* say, it is very cheap to cultivate with maximum production and minimum requirement of irrigation, fertiliser, etc. In the rainy season, the crop is sown and in February to March harvested. During the juvenile period, the crop needs sufficient water and low sunlight intensity & flowering season requires high sunlight intensity and low irrigation. Only one dose of fertiliser is sufficient for the overall cropping. One more benefit to cultivating the *N. sativa* is that the animal does not damage the crop may be the domestic animal doesn't like the taste of the leaf, as it has a kind of strong or pungent smell and bitter in taste.

In market

In the market, oil is highly demanded for dandruff treatment, applied to hair to treat dandruff from the scalp & also to reduce hair fall. So many national & international herbal and ayurvedic brands use *N. sativa* seed in their products as pure or in mix with other herbs, hair oil, shampoo, conditioner, hair mask, hair reviver, serum, etc. A variety of supplements are available in the market for digestion improvement and immunity. The ointments for pain relief and inflammation, capsules and powdered supplements, etc.

Besides this, a lot of brands still sell onion seed oil by the name of black seed oil may be this is because lack of knowledge and skill. The onion seeds are somewhat similar in morphology to black seeds (Fig. 2).

Traditional methods to use

The survey and interview with farmers gave us information on traditional methods about how we can use and consume *N. sativa* seed.

- The decoction of *N. sativa* seed with tea and jaggery is very common for gut health, weight loss, skin & hair.
- A pinch of seed powder in a glass of milk for bone health and digestive health.
- A pinch of seed powder in a spoon of honey, for throat infection, skin problems and overall metabolism.
- A pinch of seed powder with a glass of warm water for weight loss.
- Seeds mixed in flour dough for chapatti can add extra delicacy with health benefits.
- A little quantity of powder, for example, one tablespoon per 1 kg flour (what, jowar, millets, rice, maize, etc.), and add extra nutrients to the diet.

- Boiling of seed powder alone or with another herb and spray can cure infection (bacterial & fungal).
- The direct consumption of oil (4 to 6 drops). And with ginger, for cough and cold.
- As Spices, mouth fresheners, etc., in all aspects, the *N. sativa* can benefit.
- Chewing of 6 to 7 seeds regularly is good for teeth health and metabolism.
- A rare traditional practice came forward, the application of oil in the navel that can give better health benefits (immunity).

Table 1: Summary of medicinal uses of *Nigella sativa* L. with references.

Sr. no.	Medicinal uses	References
1.	Anti-bacterial	[15,18]
2.	Anti-fungal	[9,12]
3.	Anti-cancer	[4,6,10]
4.	Anti-diabetic	[20]
5.	Anti-viral	[7]
6.	Antinociceptive	[1]
7.	Anti-asthma	[8,24]
8.	Worm infection	[3]

Note: The above medicinal uses of *N. sativa* are summarised after the field survey with literature review, and not based only on the literature.

DISCUSSION

The plant *Nigella sativa* L. was collected and ethnomedicinally surveyed from Rajgarh, UP, and Washim, MH. In addition, we have studied the literature to understand & explore the medicinal value & potential of it. The study proved that the title "seed of blessing" given to the plant is exactly right. The plant has a great potential for antimicrobial activity,[9-12] anti-cancerous activity,[14] anti-diabetic activity,[20] antinociceptive effect,[1] can treat asthma,[8] etc., as Table 1 shows. For centuries, people have used the seeds traditionally to cure diseases, including decoctions, pastes, oils, and raw seeds. The main bioactive ingredient of the seed, i.e. thymoquinone and other phytochemicals (nigellidine and nigellicine) proven to be best for medicinal purposes by researchers, which is responsible for inhibiting the growth of pathogens and hence, altering the physiological processes in the human body and giving good health and no side effects. A lot of traditional practices for using the seed of *N. sativa* came to be known because of field surveys and interviews with informed people. The cultivation of plants is highly productive and cost-effective, yet it yields a high production on

a relatively small amount of land. Besides this, neither any wild nor any domestic animal can harm the crop because of its strong smell of phytochemicals and bitter taste.

CONCLUSION

The study will conclude that the plant *Nigella sativa* L. is highly beneficial from a medicinal perspective. A lot of traditional methodologies are available in order to use the seed; a variety of readymade products are available in the market to purchase directly and use them. As simple as if someone doesn't know how to use the seed. So, they can simply add the seed in their regular diet as a spice, mouth freshener & oil. Hence, they can get visible results in their metabolism.

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