

A REVIEW OF KALONJI (*NIGELLA SATIVA*)

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**ABSTRACT**

Now a day our life style changes day by day and number of health issues increases. Environmental factors such as pollution, floods as well as drought are also responsible for diseases. well as drought are also responsible for diseases. Diseases are mainly divided into four types as Hereditary, deficiency diseases, physiological and infectious diseases. Infectious diseases are caused due to bacteria, fungi, parasites. Infectious diseases treating by using antimicrobial drug. Resistance of drug to different pathogen is leading problem in world. Black seed (*Nigella sativa*) is an annual flowering plant from Ranunculaceae family, native to southwest Asia. This plant has many food and medicinal uses. The use of its seeds and oil is common for treatment of many diseases, including rheumatoid arthritis, asthma, inflammatory diseases, diabetes and digestive diseases. *N. sativa* has been traditionally used for the treatment of a variety of disorders, diseases and conditions pertaining to respiratory system, kidney and liver function, cardio vascular system and immune system support, as well as for general well-being.

**KEYWORDS:** Infectious diseases treating by using antimicrobial drug.

**1. INTRODUCTION**

*Nigella sativa* (black seed or black cumin), which belongs to the Ranunculacea family, is an annual herb with many pharmacological properties The use of *N. sativa* (NS) seeds and oil in traditional remedies goes back more than 2000 years, Black seeds and their oil have a long history of folklore usage in the Indian and the Arabian civilizations as food and medicine and have been commonly used as treatment for a variety of health conditions.

*N. sativa* is an aromatic plant of Ranunculaceae family, traditionally used by the Middle East nations for asthma, cough, bronchitis, headache, rheumatism, fever, influenza, and eczema. Several biological activities, including antioxidant activity and resolution of hepatorenal toxicity have been reported for *N. sativa* seeds *N. sativa* contains more than 30 fixed oils. The volatile oil has been proved to contain thymoquinone and many monoterpenes such as p-cymene and  $\alpha$ -pinene. The CC1<sub>4</sub> treatment increased the LPO and liver enzymes, and decreased the antioxidant enzyme levels. *N. sativa* treatment helped the elevated LPO and liver enzyme levels decrease and the reduced antioxidant enzyme levels increase The levels of liver enzymes and

total oxidative status, oxidative stress index, and myeloperoxidase in treated mice were significantly lower, and total antioxidant capacity in liver tissue was significantly higher compared to the controls. *N. sativa* is useful in the treatment of rheumatism and related inflammatory diseases and the anti-inflammatory effect was confirmed in rats.<sup>[1]</sup>

**2 Pharmacognostic Characteristic  
Morphology of Plant**

*N. sativa* is an annual flowering plant grows at 20-90 cm tall, with finely divided leaves; the flowers are white, yellow, pink, pale blue or pale purple colour, with 5-10 petals The fruit is a large and inflated capsule consists of 3-7 united follicles, each containing several seeds are small dicotyledonous, trigonus, angular, tubercular, black externally and white inside, odour slightly aromatic and taste bitter.<sup>[2]</sup>



Plant of Kalonji (Nigella sativa)



Seeds of Kalonji (Nigella sativa)



### Characteristic of Seed Powder

Macroscopically, seeds are small dicotyledonous, trigonus, angular, regulose-tubercular, 2-3.5mm×1-2 mm, black externally and white inside, odor slightly aromatic and taste bitter. Microscopically, transverse section of seed shows single layered epidermis consisting of elliptical, thick walled cells, covered externally by a papillose cuticle and filled with dark brown contents. Epidermis is followed by 2-4 layers of thick walled tangentially elongated parenchymatous cells, followed by a reddish brown pigmented layer composed of thick walled, rectangular elongated cells. Inner to the pigment layer, is present a layer composed of thick walled rectangular elongated or nearly columnar, elongated cells. Endosperm consists of thin walled, rectangular or polygonal cells mostly filled with oil globules. The powder microscopy of seed powder shows brownish black, parenchymatous cells and oil globules.<sup>[3][4]</sup>

### AYURVEDIC VIEW

Drug name- kalonji Seeds

Latin Name -*Nigella sativa*. Linn

Family -Ranunculaceae

Rasa -Katu, Tikta

Virya -Ushna

Vipaka- Katu

Guna - Laghu, Ruksha, Tikshna

### Reference from ayurvedic books

#### 1) Charak Samhita.

1. कारवी कुन्चिकाऽजाजी यवनी धान्यतुम्बरु |  
सेचनं दीपनं वातकफदौर्गन्धनाशनम् ||

(चरक सु. 27/307)

Kalonji is explained in Chark Samhita sutrasthan Aharyogi varg Annapana vidhi adhyay.<sup>[5]</sup>

2. यवानी हपुषा धन्यं त्रिफला चोपकुंचीका |

कारवी पिप्पलीमूलमजगंधाशटी वचा ||

शतव्हा जिरकं व्योषं स्वर्णक्षिरी सचित्रका |

द्वौ क्षारौ पौष्करं मूलं कुष्ठं लवणपंचकं || (च.वि.13/125-126)

Narayan churn explained in *charak samhita chikitsasthan* udarrog adhyay which contains kalonji (*Nigella sativa*) seeds useful for many disease like; udarrog, gulma, anah rog, vatrog, arshrog, parikartika, ajirna, Bhagandar, Pandurog, shwas, kas, galgrah, hrudayrog, grahani, kushatha, mandagni, jwar, dmshttra visha, mul visha, gara visha and krutrim visha we can use this *churna* in many disease by changing its *anupana*.

3. पाषाणभेदं वृषकं श्वदंष्ट्रापाठाभयाव्योषशटिनीकुंभाः |

हिंसास्त्राश्वशतीवारकणामेर्वारुकाणां त्रपुषस्य बिजम् ||

उत्कुंचीका हिंनु सवेतसाम्लं स्यादद्रे बृहतो हपुषा वचा च |

चूर्णं पिबेदश्मरीभेदपचवं सर्पिश्च गोमुत्रचतुर्गणं तैः ||

(च.वि. 26/60 -61)

Pashanbhedadi *churna* and pashabhedadi *grhita* explained in *trimarmiyachikitsa adhyay* useful in Ashmari bhedan and pathan.

4. ग्रेयाश्च रोहिषाजाजीवावातकर्शीचोरकाः |

त्वकपत्रमारिचैलानां चूर्णा वा सोपकुन्चिकाः ||

स्रोतःशृंगाटनासाक्षीशोषे तैलं च नावनम् |

प्रभाव्याजे तीलान् क्षिरे तेन पिष्टान्तदूष्मणा ||

(च. वि. 26/139)

Usefull in pratishyay rog for navan and nasya karma explained in trimarmiyachikitsa adhyay in charak chikitsasthan

5. दन्तीं द्रवन्तीं मरिचं यवानीमुपकुंचीकाम् |  
नगर हेमदुग्धां च चित्रकं चेति चूर्णितम् ||

(च.क.12/23)

It is explained in Dantidravantikarpa Adhyay in charak Samhita kalpasthan Dantidravantikarpa Adhyay. This virechak yog is usefull for many disease like ajirnarog, parshwshul, gulmarog, pliharog, udarog, gandmala, vatrog and pandhu.

6. शतावरीगोक्षूरकबृहतीकंटकारिकागुडूचीपुनर्नवोशिरमधुकद्विसरिवालोध  
-श्रेयसीकुशकाशमूलकषायक्षीरचतुरगुणं |  
बलावृषभकखराश्वोपकुन्जिकावत्सकत्रपुसौर्वारुबीजवशीतिवारकमधु  
कवचा  
-शतपुष्पाःशमभेदकवर्षाभूमदनफलकल्कसिद्धं |  
तैलउत्तरबस्तीनिर्बुद्धो वा शुद्धरिगन्धस्विन्नस्य बस्तीशूलमूत्रविकारहर  
इति ||

(च.सि. 9/8)

The above Medicated oil is described in charak samhita sidhisthan Trimarmiyasiddhi Adhyay ; wich is useful for uttar basti, it cures urinary disorders and bladder pain.

### Sushrut Samhita

1. तिक्खणोष्णं कटूकं पाके रूच्यं पिताग्नीवर्धनं |  
कटू श्लेष्मानिलहरम् गन्धाढ्यं जिरकद्वयम् ||  
कारवी करवी तद्वत् विज्ञेया सोपकुन्जीका ||

(सु. सु. 46/230)

In Sushrut Samhita sutrasthan annavidhi adhyay described that kaarvi, kalonji and karvi all three have the same qualities as cumin seeds.

### Ashtang Hruday

1. निशां पर्युषितं पेयमिच्छद्भीर्नुदजक्षयं |  
धान्योपकुन्जिकाजाजीहपुषापिप्पलीद्वयैः ||  
कारवीब्रंथीकशठीयावान्यगनीयवानकैः |  
चूर्णितैघृतपत्रस्थं नात्यमृतं तक्रमसुतम् ||

(अ.ह.वि.8/45)

In Ashtang hruday chikitsasthan Arshachikitsadhyay explained Takrarishtha wich is useful as a appetizer, anulomak, varnya, ruchya, anal inflammation, itching and pain reliefer and work as a tonic ....

2. देवदारुत्रिवरुदन्तीकटूकापंचकोलं |  
स्वरजीकायावशूकारख्यौ श्रेष्ठपाठोपकुन्जिकाः ||  
कुष्ठं सर्पसुगन्धा च द्वयक्षाशं पटुपंचकं ||  
पत्नीकं चूर्णितं तैलवसादधीघृतप्लुतं | ....

(अ.ह.वि.14/102-106)

In Ashtang Hruday chikitsasthan Gulmchikitsadhyay explained Ksharagad wich is useful in many disease like Gulma, udavarta, vardhma, arsha Udar Grahani, Krumi, Apasmar, Krutrim Vish, Unmad, Yoniog, Shukravikar, Ashmari, Snake poison etc.

3. यवानी हपुषा धन्यं शतपुष्पोपकुंचीका |  
कारवी पिपपलिमूलमजगन्धा शठि वाचा ||

(अ.ह.वि.15/14)

In Ashtang Hruday Chikitsasthan Udarchikitsadhyay explained Narayan churna wich is Useful for bunch of disease by Anupanabhedh like in Udar - takra, Gulma , anahvayu, malavrodh, mulvyadh, ajirna with warm water, Bhagandar, pandu, kas,shwasa, galgrah, hrudrog, grahni, kushtha, agnimandya, jwar, danshtravish, Mulvish, dushivish, krutrimvish and as a rechaka..

4. जिघ्नेत्त्वोरकतर्काशीवचाजाज्युपकुन्जीका

(अ.ह.उ.20/5)

In Ashtang Hruday Uttarsthan Nasarogpratishedh Adhyay above medicated churna explained for Nasya karma it is useful in Pratishyay.

4. वचोपकुंचीकाजाजीकृष्णावृषकसैधवं |

अजमोदायवक्षारशर्कराचित्रकान्वितं ||

(अ.ह.उ.34/30)

In Ashtang Hruday Uttarsthan Guhyarogpratishedh Adhyay above medicated ghrit explained wich is useful for Yonishula, Parshwshula, Hrudrog, Gulma and Arsha.

5. वृषकं मातुलुंगस्य मूलानी मदयन्तीकाम् |

पिबेन्मदैः सात्वणैस्तथा कृष्णोपकुंचिकैः ||

(अ.ह.उ.34/32)

In Ashtang Hruday Uttarsthan Guhyarogpratishedh Adhyay above kalonji Medication is explained for shul.

### Bhavprakash Nighantu (1600 A.D.)

In Bhavprakash Nighantu, shweta kalonji is explained in Haritakyadi varga, Kalonji is having properties such as dipan, Pachak, vatanulomak, Garbhashay Shudhikar, Stanyavardhan, Swedal, Krimighna.

It is Excreted though skin, Kidneys and breasts and their secretions increases.

Consuming it in large quantities increases body heat and at the same time there is a possibility of miscarriage due to uterine contraction.

पृथ्विका कारवी पृथिव पृथुकृष्णोपकुन्जिका | उपकुन्जि च कुन्ची  
बृहजिरक इत्यापि || 83

### Raj Nighantu(1500 A.D.).

In Raj Nighantu Kalonji explain in Pipalyadivarga.

पृथ्विका कटूतीक्ष्णोष्ण वातगुल्मामदोषनूत् |  
श्लेष्माध्मानहरा जिणार् जन्तूघ्नी दिपनी परा ||

( रा. नी.)

Pruthvika is the synonymous of Kalonji, it has Tikta ras katu vipak and Ushna Virya it cures Amdosh, Gulmarog and Vatrog as well as kaphavikar and adhman ; it is Pachak, Kriminashak, Jathragni pradipak.

### Kaiydev Nighantu(1500 A.D.)

In Kaiydev Nighantu Kalonji is explained in Aoushadhvarg.

कालिका काखी पृथिव पृथिवका चोपकुंविका |  
सुषवी बाष्पिका कुन्वी वरकृष्णोपकालिका || 118

Synonymous of kalonji in Kiyadev Nighantu is Kalika, karvi, pruthvi, pruthvika, upkunchika, Sushvi, Bashpika, Kunchi, Varkrushna, Upkalika.

Kalonji has katu and tikta ras and Ushna, ruksha, laghu guna. Dipan Pachan, Ruchya sangrahi, Chakshukshya, medhya, Hrudya, sangrahi, Chchardinighrah, Gulma adhamanashan. Atisarghn. properties explained in Kaiydev Nighantu.

#### Madan Pal Nighantu(1400 A.D.).

In Madan Pal Nighantu kalonji is explained under the shuntyadi varga.

कलिका बष्पीका कुंवि: काखी चोपकुंविका |  
पृथिवका सुषवी पृथिव स्थूलाजाज्युपकालीका || ३०  
जीरकंतितयमं रुक्क्षं कटूणादिपनं लघु |  
संभ्राही पित्तलमं मेध्यं गभाशय विशुद्धीकृत ||  
ज्वरघ्नं पचनं वृष्यं बल्यं रुच्यं कफापहम् |  
चक्षूष्यं पवनाध्मानगुल्मच्छर्दयतिसारहत ||  
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Synonymous of kalonji in Madanpal Nighantu is Kalika, Bashpika, Kunji, karvi, Upkunjika, Pruthvika, Sushvi, pruthvi, Ajaji. Three types of Jeerak having rukshya, Laghu and ushna properties.

#### Shodal Nighantu(1200 A.D.)

Kalonji is explained in Shatpushpadi varga in shodal Nighantu.

#### Priya Nighantu(1983 A.D)

उपकुंवी कृष्णकाया मंगरैलेति कथ्यते |  
दिपनी पाचनीरुच्याध्मानहत् कफवातजित्वा || ९

Acharya Priyavrat Sharma has described the properties of Kalonji in the shatpushpadi varga.

5. कत्वन्जिका पाचनदिपनी परा सन्धानयोग्या कफवातहारीणी |  
प्रवर्तयत्यातं वमुष्णावीर्या भक्तेऽपि भक्तिं बहुलीकरोती ||  
(सिद्धभैषज्यमणिमाला)

#### Recent Ayurvedic Texts

##### Ayurvedic Pharmacopeia of India

In this book detailed information of kalonji including vernacular names, microscopic and macroscopic properties, identity, purity and strengths, chemical composition, properties and action, important formulation, therapeutic uses, dose of drug are explained.

#### Indian Medicinal Plants

In this book vernacular name, botanical names, distribution, chemical composition, properties of Kalonji references from samhita and nighantu are given.

#### Database of Medicinal Plants (Vol: 6)

Book consists of botanical names, family name, synonyms, classical names, vernacular names, botanical description, distribution, parts used, action and uses. It also has information about ayurvedic properties, Karma,

rogaknata, sidhdha properties, pharmacognacy, chemical constituents, pharmacological actions, toxicology, therapatic evaluation, formulation and preparation, trade and commerce, substitutes and ad adulterants, propagation and cultivation.

#### Dravyagun Vidyan by Vd. V. M. Gogate

In dravyagun vidyan book gan, kul, botanical name, sanskrit name, vernacular name, swarup, Utpattistan, chemical composition, properties, karma and prayog, sanstanic karma, upayukt aang, kalp is explained.

#### Dravyagun Vidyan by Acharya Priyavart Sharma

In this book gan, kul, botanical name, sanskut name, swarup, Utpattistan, chemical composition, properties, karma and prayog, upayukt aang, kalp is explained.

#### Materia Medica of Ayurved

This book explains all the varieties of Kalonji in shuntadi varga.

#### Chemical Composition Of Black Seeds

Many active compounds have been isolated, identified and reported so far in different varieties of black seeds. The most important active compounds are thymoquinone (30%-48%), thymohydroquinone, dithymoquinone, p-cymene (7%-15%), carvacrol (6%-12%), 4-terpineol (2%-7%), t-anethol (1%-4%), sesquiterpene longifolene (1%-8%)  $\alpha$ -pinene and thymol etc. Black seeds also contain some other compounds in trace amounts. Seeds contain two different types of alkaloids; i.e. isoquinoline alkaloids e.g. nigellicimine and nigellicimine-N-oxide, and pyrazol alkaloids or indazole ring bearing alkaloids which include nigellidine and nigellicine. Moreover, *N. sativa* seeds also contain alpha-hederin, a water soluble pentacyclic triterpene and saponin, a potential anticancer agent.<sup>[6]</sup>

Some other compounds e.g. carvone, limonene, citronellol were also found in trace amounts. Most of the pharmacological properties of *N. sativa* are mainly attributed to quinine constituents, of which TQ is the most abundant. On storage, TQ yields dithymoquinone and higher oligocondensation products. The seeds of *N. sativa* contain protein (26.7%), fat (28.5%), carbohydrates (24.9%), crude fibre (8.4%) and total ash (4.8 %). The seeds are also containing good amount of various vitamins and minerals like Cu, P, Zn and Fe etc. The seeds contain carotene which is converted by the liver to vitamin A. Root and shoot are reported to contain vanillic acid.

The seeds reported to contain a fatty oil rich 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.  $\alpha$ -sitosterol is a major sterol, which accounts for 44% and 54% of the total sterols in Tunisian and Iranian varieties



of black seed oils respectively, followed by stigmasterol (6.57-20.92% of total sterols).<sup>[7]</sup>

#### 4 Scientific Resources and Pharmacological Potentials

The extensive researches using modern scientific techniques were carried out by various researchers on *N. sativa* since it is believed to be a miraculous herb that can cure multiple ailments and disorders. A number of pharmacological actions of *N. sativa* have been investigated in the past few decades.

##### Antibacterial Activity

Many studies have been reported the antibacterial activity of *N. sativa*. Thymoquinone is the major chemical constituent isolated from this plant. It was found to have antibacterial activity against most bacteria especially in Gram-positive cocci type such as staphylococcus aureus and staphylococcus.<sup>[8][9]</sup>

##### Antifungal Activity

Methanolic extracts of *N. sativa* have the strongest antifungal effect followed by the chloroform extracts against different strains of *Candida albicans*. Aqueous extracts showed no antifungal activity. An intravenous inoculum of *Candida albicans* produced colonies of the organism in the liver, spleen and kidneys. Treatment of mice with the plant extract 24 h after the inoculation caused a considerable inhibitory effect on the growth of the organism in all organs studied. Khan *et al.* in 2003 reported that the aqueous extract of *N. sativa* seeds exhibits inhibitory effect against candidiasis in mice. A 5-fold decrease in *Candida* in kidneys, 8-fold in liver and 11-fold in spleen was observed in the groups of animals post-treated with the plant extract. These findings were also confirmed by Histopathological examination of the respective organs.<sup>[10]</sup> Antidermatophyte activity of ether extract of *N. sativa* and TQ was tested against eight species of dermatophytes: were isolated from seeds of *N. sativa* and sequenced. The Ns-D1 and Ns-D2 defensins displayed strong divergent antifungal activity towards a number of phytopathogenic fungi.<sup>[11]</sup>

##### Anti-Schistosomiasis activity

The effect of NSO against the liver damage induced by *Schistosoma mansoni* (*S. mansoni*) infection in mice was studied by Mahmoud *et al.* When the NSO was given alone, it reduced the number of *S. mansoni* worms in the liver and decreased the total number of ova deposited in both the liver and the intestine. When NSO was administered in combination with PZQ, the most prominent effect was a further lowering in the dead ova number over that produced by PZQ alone. Infection of mice with *S. mansoni* produced a pronounced elevation in the serum activity of ALT, GGT, with a slight increase in AP level, while reduce serum albumin level. Administration of NSO succeeded partially to correct the previous changes in ALT, GGT, AP activity, as well as the Alb content in serum. These results suggest that NSO may play a role against the alterations caused by *S. mansoni* infection.<sup>[12]</sup> Results of *in vitro* testing of *N.*

*sativa* seeds against *Schistosoma mansoni*, *miracidia*, *cercariae*, and adult worms indicate its strong biocidal effects against all stages of the parasite and an inhibitory effect on egg-laying of adult female worms. *N. sativa* seeds also induced an oxidative stress against adult worms which indicated by a decrease in the activities of antioxidant enzymes, superoxide dismutase (SOD), glutathione peroxidase, and glutathione reductase and enzymes of glucose metabolism, hexokinase and glucose-6-phosphate dehydrogenase. Disturbing of such enzymes of adult worms using *N. sativa* seeds could in turn render the parasite vulnerable to damage by the host and may play a role in the anti-schistosomal potency of the *N. sativa* seed.<sup>[13]</sup>

##### Antioxidant activity

Many in-vivo and in-vitro studies have been conducted with *Nigella sativa* extracts to evaluate the antioxidant property. It was found that *Nigella sativa* and its derivatives possessed potential radical scavenging and inhibitory effects on oxidative stress.<sup>[14][15][16]</sup> Cherif *et al.*, investigated the effect of dietary *Nigella sativa* seeds on meat fatty acids and evaluated oxidative activity. Twenty-eight Barbarine male lambs were selected for the study. The diet was given in two different feeding systems i.e. higher or low concentration. It was observed in the end that Thiobarbituric acid reactive substances (TBARS) were lower in the meat of lambs receiving NSS compared to the meat of lambs.<sup>[17][18]</sup>

##### Antidiabetic Activity

The therapeutic potentials of  $\alpha$ -lipoic acid ( $\alpha$ -LA), L-carnitine, and *N. sativa* or combination of them in carbohydrate and lipid metabolism was evaluated in a Rat model of diabetes which was induced by single *i.p.* injection of streptozocin (STZ) 65 mg/kg. For evaluation of glucose metabolism, fasting blood glucose, insulin, insulin sensitivity, HOMA, C-peptide, and pyruvate dehydrogenase activity were determined. Either  $\alpha$ -LA or *N. sativa* significantly reduced the elevated blood glucose level. The combination of 3 compounds significantly increased the level of insulin and C-peptide. Combination of  $\alpha$ -LA, L-carnitine and *N. sativa* will contribute significantly in improvement of the carbohydrate metabolism in diabetic rats, thus increasing the rate of success in management of DM.<sup>[19]</sup>

##### Anticancer Activity

Several studies have been conducted to examine the anticancer effect of *Nigella sativa*. The extract was tested in cancer cell-derived from mice. The result showed chemopreventive potential found in the thymoquinone. Khalife *et al.*, investigated that thymoquinone induced apoptosis through p53-independently with p21 and arrested cell-cycle S phase in human colon cancer cells. The active compound showed anticancer effects towards many cancer cell lines including MCF-7/Topo breast carcinoma cells and also decline regulator of NF-B and MMP-9 in Panc-1 cells and bcl-2 in gastric cancer thymoquinone was demonstrated by an in vivo study

carried out on 63 adult male rats. Models were divided into nine groups. The administration of *Nigella sativa* was found to be very effective and prevent Formaldehyde-induced apoptosis and epithelial damage.<sup>[20][21]</sup>

#### Immunomodulatory Activity

A group of medicinal plants including black seed were examined for their immuno-modulatory effect in BALB/c mice. Treatment (intraperitoneal injection) with five doses of methanolic extract for Black seed was found to enhance the total white blood cells count [up to  $1.2 \times 10^4$  cells/mm<sup>3</sup>]. Bone marrow cellularity also increased significantly ( $P < 0.01$ ) after the administration of the Black seed extract. Spleen weight of the black seed treated groups was significantly increased ( $P < 0.01$ ). Two groups of mice were immunosuppressed with cyclophosphamide, the one which pretreated with the black seed extracts significantly ( $P < 0.01$ ) restored their resistance against lethal infection with the predominately granulocyte-dependant *Candida albicans*. These results confirmed the immunomodulatory activity of black seed, and may have therapeutical implications in prophylactic treatment of opportunistic infections and as supportive treatment in oncogenic cases.<sup>[22]</sup>

#### Gastro-Protective Activity

The anti-ulcer potential of *N. sativa* aqueous suspension on experimentally induced gastric ulcers and basal gastric secretion in rats was examined to rationalize its use by herbal and Unani medicine practitioners. Acute gastric ulceration was produced by various noxious chemicals (80% ethanol, 0.2 mol/L NaOH, 25% NaCl and indomethacin) in Wistar albino rats. Anti-secretory studies were undertaken in a separate group of rats. Gastric wall mucus contents and non-protein sulfhydryl concentration were estimated, and gastric tissue was examined histopathologically. An aqueous suspension of black seeds significantly prevented gastric ulcer formation induced by necrotizing agents. It also significantly ameliorated the ulcer severity and basal gastric acid secretion in pylorus-ligated Shay rats. Moreover, the suspension significantly replenished the ethanol-induced depleted gastric wall mucus content levels and gastric mucosal non-protein sulfhydryl concentration. The anti-ulcer effect was further confirmed histopathologically. The anti-ulcer effect of *N. sativa* is possibly prostaglandin-mediated and/or through its antioxidant and anti-secretory activities.<sup>[23]</sup>

#### Nephroprotective Activity

The nephro-protective effect of vitamin C and *N. sativa* oil was observed against gentamicin (GM) associated nephrotoxicity in rabbits. Serum creatinine, blood urea nitrogen, and antioxidant activity were measured as indicators of nephrotoxicity for all the groups of rabbits. It was revealed that vitamin C and *N. sativa* oil both had nephroprotective effect as they lowered the values of serum creatinine, blood urea nitrogen, and antioxidant activity as compared to GM

control group values. When these two antioxidants were given as combination, they proved to have synergistic nephroprotective effect.<sup>[24]</sup>

#### Pulmonary-protective Activity and Anti-asthmatic Effect

As per the study, the activity of nigellone and thymoquinone was demonstrated by an invivo study carried out on 63 adult male rats. Models were divided into nine groups. The administration of *Nigella sativa* was found to be very effective and prevent Formaldehyde-induced apoptosis and epithelial damage.<sup>[25]</sup>

#### Testicular-protective Activity

The protective role of TQ on testicular toxicity of methotrexate on male C57BL/6 mice (6 weeks old,  $20 \pm 2$  g) was investigated. TQ treatment decreased TAC and prevented the increase in the myeloperoxidase activity. Light microscopy showed in mice that receiving methotrexate resulted in interstitial space dilatation, edema, severe disruption of the seminiferous epithelium and reduced diameter of the seminiferous tubules. Administration of TQ reversed histological changes of methotrexate significantly. It was suggested that TQ use may decrease the destructive effects of methotrexate on testicular tissue of patients using this agent.<sup>[26]</sup>

#### Neuro- pharmacological Activities

The aqueous and methanol extracts of defatted *N. sativa* L. seeds were shown to possess a potent central nervous system and analgesic activities, especially depressant action in the case of the methanolic extract.<sup>[27]</sup>

An anxiolytic drug acts by increasing the 5-HT and decreasing the 5-HIAA (hydroxyindole acetic acid) levels in brain. A long term administration of *N. sativa* increases 5-HT levels in brain and improves learning and memory in rats. Repeated administration of *N. sativa* decreases 5-HT turnover and produces anxiolytic effects in rats.<sup>[28]</sup>

#### Anticonvulsant Activity

The antioxidant effects of curcumin, NSO and valproate on the levels of malondialdehyde, nitric oxide, reduced glutathione and the activities of CAT, Na<sup>+</sup>, K<sup>+</sup>-ATPase and acetylcholinesterase in the hippocampus of pilocarpine-induced animal model of epilepsy was evaluated and left for 22 d to establish the chronic phase of epilepsy. The animals were then treated with curcumin, NSO or valproate for 21 d. Treatment with curcumin, NSO or valproate ameliorated most of the changes induced by pilocarpine and restored Na<sup>+</sup>, K<sup>+</sup>-ATPase activity in the hippocampus to control levels. Results indicated the anticonvulsant and potent antioxidant effects of curcumin and NSO in reducing oxidative stress, excitability and the induction of seizures in epileptic animals and improving some of the adverse effects of antiepileptic drugs.<sup>[29]</sup>

### Contraceptive and Anti-fertility activity

Oral administration of Hexane extract of *N. sativa* seeds L. prevented pregnancy in Sprague-Dawley rats at a dose of 2 g/kg daily on day's 1-10 postcoitum. While column fractions and sub-fractions of Hexane extract of *N. sativa* seeds also showed significant anti-fertility activity. At contraceptive dose, the active hexane extract exhibited only mild uterotrophic activity comparable almost to 0.002 mg/kg dose of 17 varies; is directly proportional to-Ethinylestradiol, but was devoid of any estrogenicity in the immature rat bioassay.<sup>[30]</sup>

The ethanolic extract of *N. sativa* seeds was found to possess an anti-fertility activity in male rats which might be due to inherent estrogenic activity of *N. sativa*.<sup>[31]</sup>

### Antioxytotic Activity

The antioxytotic properties of *N. sativa* were reported in some preliminary studies. *N. sativa* seeds inhibit the uterine smooth muscle contraction induced by oxytocin stimulation. The volatile oil of *N. sativa* seeds inhibited the spontaneous movements of rat and guinea pig uterine smooth muscle and also the contractions induced by oxytocin stimulation which suggest the anti-oxytotic potential of *N. sativa* seeds oil.<sup>[32]</sup>

### CONCLUSION

*Nigella sativa* (kalonji) is one the most commonly used medicinal herbs in various systems of medicine in the folk system, Ayurveda, Siddha and Yunani. This herb is associated with some significant therapeutic actions. *N. sativa* seeds, its oil and extracts and some of its active principles, particularly TQ and alpha-hederin, possess remarkable *in vitro* and *in vivo* pharmacological activities against a large variety of diseases and found to be relatively safe. Various biological properties like wound healing, anti-diabetic, anti-inflammatory, antidiabetic, antidepressant, nephroprotective, antibacterial, anti-viral, antifungals *nigella sativa* can be use.

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