INTRODUCTION
The seeds of *Nigella sativa* is known by many different names like black seeds (or) black cumin. In old Latin, it is called as Panacea meaning ‘cure all’ while in Arabic it is termed as ‘Habbah Sawdada’ or Habbat al Baraka’ translated as ‘seeds of blessing’. In china it is referred as Hak Jung Chou while in India it is called as Kalonji and in Persian, it is called as Shoneez. The plant belongs to the Ranunculaceae family of flowering plants and genus of about 14 species including *Nigella arvensis*, *Nigella ciliaris*, *Nigella damascence*, *Nigella hispanica*, *Nigella integrifolia*, *Nigella nigellastrum*, *Nigella orientalis* and *Nigella sativa* respectively. Among these, *Nigella sativa* is the species most exhaustively investigated for therapeutic purposes although other species have also been implicated for therapeutic uses [1].

Plant description
It is a spice that grows in the Mediterranean region and in western asian countries including India, Pakistan and Afghanistan. The species grow to 20-30 cm tall, with finely divided leaves wherein the leaf segments are 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 while in some species (e.g. *Nigella damascene*), the capsule is large and inflated. The parts of the plant most commonly used for the therapeutic purposes in the “Alternative Medicinal” systems are the seeds which are contained in an inflated capsule formed from the united follicles containing considerable amount of oil having pungent and bitter taste. Commonly the seeds are used primarily as a spice and food preservative [1, 2].
Pharmacognostical studies on seeds
Macroscopical characteristics
They are small dicotyledonous, trigonus, angular, regulose-tubercular, 2-3.5x1-2 mm, black externally and white inside, odour slightly aromatic and taste bitter [3].

Microscopical and powder characteristics
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 reddish brown pigmented 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 seeds powder shows brownish black, parenchymatous cells and oil globules [4, 5].

Physical constant: Foreign matter - 2% w/w ; total ash - 6 % w/w ; acid insoluble ash - 0.2 % w/w ; alcohol soluble extractive - 20% w/w ; water soluble extractive - 15 % w/w ; total fixed oil – 25 - 32 % w/w ; volatile oil - 0.42 % w/w ; organic matter – 3.91 % w/w ; loss on drying - 4% w/w [6].

Traditional uses
Traditionally the seeds and its oil are used in several diseases. The seeds are considered as bitter, pungent, aromatic, appetizer, stimulant, diuretic, emmenagogue, galactagogue, anthelmintic, acrid, thermogenic, carminative, anodyne, deodorant, digestive, constipating, sudorific, febrifuge, expectorant, purgative, abortifacient. They are used in ascites, cough, jaundice, hydrophobia, fever, paralysis, conjunctivitis, piles, skin diseases, anorexia, dyspepsia, flatulence, abdominal disorders, diarrhoea, dysentery, intrinsic hemorrhage and amenorrhea. Seed oil is a local anesthetic [7-9].

The Chemical Composition of The Seeds
Historically, the chemical investigations on the Nigella sativa seeds started on the year 1880 by Greenish [10] published the first report concerning the presence of 37% oil and 4.1% ash (calcium salts) in the seeds. The general chemical composition of the seeds as we know it today is depicted in Table I [11-13].

Chemical composition of Nigella sativa Oil
The chemical analysis of Nigella sativa total oil revealed the presence of both a fixed oil and a volatile oil. The major component was the fixed oil whereas the volatile oil ranged from 0.4-0.7% of the seeds weight [14]. The fixed oil chemical composition is outlined in Table 2 [15, 16 ].

Generally, there were no significant variations in the chemical composition of the fixed oils of seeds grown in Egypt, Sudan, Ethiopia, India, Turkey and Syria. However, Al-Jassir noted that the seeds grown in Qassim, Saudi Arabia, contained in addition to the fatty acids depicted in Table 2, two more acids which were lignoceric acid about(1%) and myristoleic acid(0.18%) without the presence of eicosadienoic acid. Lignoceric acid is not found in many other edible vegetable oils.

Specific chemical analyses of the volatile oil started during the years 1960-1963 by Mahfouz and El-Dakhakhny[17], and Canonica et al.[18]. These studies were complemented by most recent ones which revealed various pharmacologically active constituents that included in Table 3 [19-23].

Non –Oily Components of the seeds
Minerals
Analysis of Nigella sativa seeds, ash revealed the presence of 0.5-1% calcium, 0.6% phosphorus, 0.6% potassium and 0.1% sodium of the total seeds weight.

Saponins
The major saponin in the defatted seeds of Nigella sativa is the glycoside alpha-hederin or Helixin or melanthin which on acid hydrolysis releases its sugar rhamnose/arabinose and gives the aglycone hederagenin (or melanthigenin) or caulospogenin [24-26].

Alkaloids
Three types of alkaloids were isolated from the defatted seeds of Nigella sativa. These were identified as the indazole nigelicine [27], the isoquinoline nigellimine[28], and its N-oxide[29], and the imidazole alkaloid nigellidine [30].

Dosage and Administration
According to literature available the seeds are given in powder form in the dose of 0.5-1gm alone or mixed with honey. Seeds are ground in vinegar to make a paste to be applied externally on vitiligo. Seeds are heated in vegetable oil (1:10) on slow fire to be used externally [31,32].

Therapeutic and Pharmacological Actions
The popularity of the plant was highly enhanced by the ideological belief in the herb as a cure for multiple diseases. In fact, this plant has occupied special place for its wide range of medicinal value in Islamic civilizations. Due to the sayings of the HOLY prophet, Mohammed (peace be upon him)
that the plant is full of medicinal value, it gained immense popularity. Consequently, Kalonji has been extensively studied particularly in Islamic world, which justifies its broad traditional therapeutic value.

Anticancer Activity

*N. sativa* decreases DNA damage and thereby prevents initiation of carcinogenesis in colonic tissue secondary to exposure to toxic agents such as azoxymethane [33]. In fact, sustained delivery of TQ (thymoquinone) (derived from *N.sativa*) is almost as effective in causing apoptosis of colon cancer cells as sustained delivery of 5-fluorouracil [34]. Similarly, hepatic metastasis from tumors such as mastocytes is markedly decreased following administration of *N.sativa* [35].

Antidiabetic Activity

*N.sativa* is of great therapeutic benefit in diabetic individuals and those with glucose intolerance, as it accentuates glucose-induced secretion of insulin, besides having a negative impact on glucose absorption from the intestinal mucosa [36,37]. In fact, *N.sativa* attenuates the damage to β-cells of the pancreas following exposure to toxic elements such as cadmium [38]. Similarly, *N.sativa* administration attenuates the ulcerative effects of ethanol on gastric mucosa by decreasing the glutathione - S transferase levels in gastric mucosa [39].

Antiparasitic Activity

*N. sativa* also demonstrates anti-parasitic effects. For instance, its administration decreases the number of eggs as well as worms in schistosomiasis, which tends to affect in hepatic and intestinal tissues [40].

Hepatoprotective Activity

*N. sativa* administration protects hepatic tissue from deleterious effects of toxic metals such as lead and attenuates hepatic lipid peroxidation following exposure to chemicals such as carbon tetrachloride [41,42].

Antioxidant Activity: TQ has been shown to exhibit anti-oxidant property through different mechanisms in several recent reports. For example, it inhibits the production of 5-hydroxyeicosa-tetraenoic as well as 5-lipooxygenase products[43], both of which are required for the viability of colon cancer cells. It was shown to work as a scavenger of various reactive oxygen species including superoxide radical anion and hydroxyl radicals [44,45]. Additionally, it was able to produce significant reductions in hepatic antioxidant enzymes such as superoxide dismutase (SOD), catalase and glutathione peroxidase. It has been shown that TQ could inhibit iron-dependent microsomal lipid peroxidation efficiently in rats with doxorubicin induced hyperlipidemic nephropathy [46]. The compound was observed to decrease cellular oxidative stress by inducing glutathione in experimental allergic encephalomyelitis in female Lewis rats [47].

Anti-inflammatory and Analgesic Activity

The compound is reported to be a potent inhibitor of leukotrienes formation in human blood cells. The inhibitory effect was found to be dose as well as time-dependent and the effect was exerted on both 5-lipooxygenase and Leucotriene-C4-synthase (LT4synthase) activity [48]. In another study [49], the rats pre-treated with oral TQ doses showed complete protection against acetic acid-induced colitis compared to sulfasalazine (500 mg/kg) control group wherein TQ was found to suppress the production of NO (Nitric Oxide) by macrophages which is useful in ameliorating the inflammatory and autoimmune conditions [50]. The anti-inflammatory activity of Black cumin seed oil has also been evaluated using carrageenan-induced paw edema in rats and croton oil-induced ear edema in mice by Hajhashemi and colleagues in 2004. Although oral administration of the oil at doses of 100, 200 and 400 μl/kg did not exert a significant anti-inflammatory effect in the carrageenan test, the intraperitoneal injection of the same doses significantly inhibited carrageenan-induced paw edema [51].

Immunomodulatory Activity

The immunomodulatory and immunotherapeutic potentials of black seed oil and its active ingredients have been investigated [52]. The oil and some of its active ingredients showed beneficial in immunomodulatory properties, augmenting the T-cell and natural killer cell-mediated immune responses.

Hypocholesterolemic Activity

According to the study done by Inayat et al, it was concluded that *N. sativa* produced antiatherogenic effect by decreasing low density lipoprotein cholesterol level significantly. It also increases high density lipoprotein cholesterol level [53].

Treating Skin Infections

There are reports that the oil from the seeds can be used to treat dermatitis topically [54].

Stimulation of Uterine Contractions: Seeds have shown to stimulate uterine contractions when used in large amounts, leading to abortion [55].

Anti hypertensive and Diuretic Activity: Seeds have shown antihypertensive and diuretic activity when studied in rats [56].

Antimicrobial and Antifungal Activity: Seeds also possess considerable antimicrobial activity as reported by various studies. The antifungal activity was observed when the aqueous extract of the seeds was used in vivo studies [57].

Table 1. General Chemical components of seeds

<table>
<thead>
<tr>
<th>S.No</th>
<th>Chemical Constituents</th>
<th>% Range (w/w)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Oil</td>
<td>31-35.5</td>
</tr>
<tr>
<td>2</td>
<td>Protein</td>
<td>16-19.9</td>
</tr>
<tr>
<td>3</td>
<td>Carbohydrate</td>
<td>33-34</td>
</tr>
<tr>
<td>4</td>
<td>Fibre</td>
<td>4.5-6.5</td>
</tr>
<tr>
<td>5</td>
<td>Ash</td>
<td>3.7-7</td>
</tr>
<tr>
<td>6</td>
<td>Saponins</td>
<td>0.013</td>
</tr>
<tr>
<td>7</td>
<td>Moisture</td>
<td>5.7</td>
</tr>
</tbody>
</table>

Table 2. Fixed oil components of seeds

<table>
<thead>
<tr>
<th>S.No</th>
<th>Fixed oil Constituents</th>
<th>% Range (w/w)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Linoleic Acid</td>
<td>44.7-56</td>
</tr>
<tr>
<td>2</td>
<td>Oleic Acid</td>
<td>20.7-24.6</td>
</tr>
<tr>
<td>3</td>
<td>Linolimic Acid</td>
<td>0.6-1.8</td>
</tr>
<tr>
<td>4</td>
<td>Arachidic Acid</td>
<td>2-3</td>
</tr>
<tr>
<td>5</td>
<td>Palmitoleic Acid</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Eicosadienoic Acid</td>
<td>2-2.5</td>
</tr>
<tr>
<td>7</td>
<td>Palmitic Acid</td>
<td>12-14.5</td>
</tr>
<tr>
<td>8</td>
<td>Stearic Acid</td>
<td>2.7-3</td>
</tr>
<tr>
<td>9</td>
<td>Myristic Acid</td>
<td>0.16</td>
</tr>
<tr>
<td>10</td>
<td>Sterols</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Table 3. Volatile oil components of seeds

<table>
<thead>
<tr>
<th>S.No</th>
<th>Volatile Oils</th>
<th>% Range (w/w)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thymoquinone</td>
<td>27.8</td>
</tr>
<tr>
<td>2</td>
<td>Carvacrol</td>
<td>5.8-11.6</td>
</tr>
<tr>
<td>3</td>
<td>P-cymene</td>
<td>15.5-31.7</td>
</tr>
<tr>
<td>4</td>
<td>Alpha-pinene</td>
<td>9.3</td>
</tr>
<tr>
<td>5</td>
<td>4-terpineol</td>
<td>2.6-6</td>
</tr>
<tr>
<td>6</td>
<td>longifolene</td>
<td>1-8</td>
</tr>
<tr>
<td>7</td>
<td>t-anthole benzene</td>
<td>0.25-2-3</td>
</tr>
</tbody>
</table>

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

CONCLUSION

In recent days, the ethanobotanical and traditional uses of natural compounds, especially of plant origin received much careful as they are well observed and tested for their efficacy and generally believed to be safe for human use. They obviously
deserve scrutiny on modern scientific lines such as phytochemical investigation, biological evaluation on experimental animal models, toxicity studies and investigation of molecular mechanics of action of isolated phytoconstituents. The *Nigella sativa* seeds oil has anti-inflammatory, analgesic, antipyretic, antimicrobial, antidiabetic, immunomodulatory and antineoplastic activity. The Oil decreases blood pressure and increases respiration. But number of other pharmacological activities are yet to be explored. In future studies, the isolated principles from seeds need to be evaluated in scientific manner using specific experimental animal models and clinical trials are to be done to understand molecular mechanism of action, in search of lead molecule from natural resources.

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**CONFLICT OF INTEREST**

The authors declare that they have no conflict of interest.

**REFERENCES**


