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Medicinal properties of *kunjad* (*Sesamum indicum*): A review

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Abstract

Kunjad (*Sesamum indicum*) is a drug of herbal origin, belonging to the family pedaliaceae. *Kunjad* is one of the world's important oil crops. While sesame seeds have been grown in tropical regions throughout the world since prehistoric times, traditional myths hold that their origins go back even further. According to Assyrian legend, when the Gods met to create the world, they drank wine made from sesame seeds. These seeds were thought to have first originated in India and were mentioned in early Hindu legends. In these legends, tales are told in which sesame seeds represent a symbol of immortality. Sesame seeds also contain two unique substances: sesamin and sesamol known to have a cholesterol lowering effect in humans and to prevent high blood pressure. Both of these were also reported to increase the hepatic mitochondrial and the peroxisomal fatty acid oxidation rate in experimental animals. Cephalin, a phospholipid from sesame seed has been reported to possess hemostatic activity. The oil has wide medical and pharmaceutical applications. In this paper, an effort has been made to compile the phytochemical studies, pharmacological actions, therapeutic uses and pharmacological studies of *Kunjad* (*Sesamum indicum*).

Keywords: Kunjad, Til, sesamum, Mohallil-e-Auram, anti-inflammatory, antioxidant

Introduction

Kunjad (*Sesamum indicum*) is an erect annual plant more or less foetid and glandular. The plant is indigenous to tropical Africa and cultivated throughout the warm part of India. It occurs from August to June. Flowering take place during October to December and fruiting from December to January. Three varieties of sesamum seeds are found (i) White seed (ii) Red or Brown seed (iii) Black seed. The black variety is the most common and yield the best quality of oil and is the also the best suited for medicinal purposes. The traditional use of *Kunjad* for curing many diseases has a long history has effectively been employed for the treatment of various ailments like *Hudar* (rheumatism), *Bawaseer* (Haemorrhoids), *Dard-e-Sar* (Headache), *Daad* (Eczema), *Falij* (Paralysis), *Ganj* (Baldness), *Is'haal* (diarrhoea), *Inteshar-e-Shaar* (Hair Falling), *Juzam* (Leprosy), *Kharish* (Itching), *Mouch* (Sprain). (Anil kumar *et al.*, 2010; Nadkarni, 2007; Anonymous, 2007; Ibn Baitar, 1999; Ghani, ynm; Kirtikar and Basu, 2005) [2, 18, 3, 12, 16].

Vernacular names

Afghani	: Kunjit, Til
Annam	: Chima
Arabic	: Djyldjylan, Duhn, Samsam, Simsim
Bengali	: Bhadutil, Khaslatil, Krishnatil, Rasi, Sankitil, Sumsum, Tel, Til
Bombayese	: Ashadital, Bariktil, Krishna Til, Tal, Til
Brazil	: Gergelim, Jerxelim
Burmese	: Hanan
Cambodia	: Longo
Canarese	: Achchellu, Ellu, Wollelu, Yallu
Catalan	: Sesamo
Central provinces	: Til, Tili
Chinese	: Hu Ma
Deccan	: Bariktel, Til
Egyptian	: Semsem
English	: Gingelly, Sesame

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French Guiana	:	Ounge, Sesame
Fulah	:	BeneLubeungany
German	:	Sesam
Gujrati	:	Mithutel, Tal, Tel, Til
Hindi	:	Gingli, Krishna Tel, Mitha Tel, Til, Tir
Kumaoni	:	Bhunguru, Til
Malayalam	:	Chitelu, Chiterallu, Ellu, Karellu
Marathi	:	Til, Tila, Zilechatil
Nepali	:	Til
Orissa	:	Khasa, Rasi
Pampamgan	:	Langis
Persian	:	Kunjad
Philippines	:	Ajonjoli, Lana, Lingo
Portuguese	:	Gergelim
Punjabi	:	Kunjad, Til, Tili
Sanskrit	:	HimadhanyaJatali, Papaghna, Pavitra, Pitratarpana, Tila, Puraphala, Putadhanya, Snehaphala, Tailaphala, Vanodbhava
Santal	:	Kattilmin, Tilmin
Sindhi	:	Thirr, Til
Sinhalese	:	Talla, Tallatta, Teltala, Tunpattala, Waltala
South Africa	:	Gingili, SemSem, Sesame
Spanish	:	Sesame
Sumatra	:	Benjam
Suto	:	Molekella
Tagalong	:	Langnga, Languis, Lenganga, Linga
Tamil	:	Ellu, Nuvulvu, Yelluchedi
Telugu	:	Nuvvulu, Pollanuvvulu
United States	:	Benne
Urdu	:	Til
Visayan	:	Longa

(Ibn Baitar, 1999; Ghani, ynm; Kirtikar and Basu, 2005 [16]; Nadkarni, 2007; Anonymous, 2007) [12, 3].

Description according to unani classical literature

Three varieties of sesamum seeds are found (i) White seed (ii) Red or Brown seed (iii) Black seed. The black variety is the most common and yield the best quality of oil and is the also the best suited for medicinal purposes. But the white variety is richer in oil (Ghani, ynm; Kirtikar and Basu, 2005 [16]; Nadkarni, 2007) [18]. The author of *Makhzanul Mufradat*, Kabiruddin mentions about two (2) varieties of the drug: Black seed & White seed.

Mizaj

Hot 10 and Wet 10 (Ibn Baitar, 1999; Ghani, ynm; Anonymous, 2007)
Hot 20 and Wet 20 (Hakeem, 2002)

Hot and Wet (Ghulam, 2007)

Dose

Up to 7 grams (Ghani, ynm)
7-10 grams (Kabiruddin, 2000)
5 grams (Anonymous, 2007) [3].
Powder 5-10 grams (Anonymous, 2008) [4].

Oil

5-7 ml (Kabiruddin, 2000)
10-20 ml (Hakeem, 2002)
5 to 20 ml (Anonymous, 2008) [4]

Actions

Table 1: (Actions of *Kunjad*)

Action	Reference
<i>Dafa-e-Tashannuj</i> (Anticonvulsant)	Ghani, ynm
<i>Habis-e- Khoon bawaseer</i> (Antiheamorrhoids)	Kabiruddin, 2000; Ghulam, 2007; Hakeem, 2002
<i>Mohallil-e-Auram</i> (Resolvent)	Hakeem, 2002; Ghani, ynm; Ghulam, 2007; Kabiruddin, 2000; Kirtikar and Basu, 2005 [16]; Ibn Baitar, 1999 [12].
<i>Mulattif</i>	Kirtikar and Basu, 2005 [16]; Nadkarni, 2007 [18].
<i>Musakhin</i>	Ghani, ynm; Kabiruddin, 2000; Kirtikar and Basu, 2005 [16]; Hakeem, 2002; Ibn Baitar, 1999 [12].
<i>Muqawwi</i> (Tonic)	Ghani, ynm; Nadkarni, 2007 [18]; Kirtikar and Basu, 2005 [16]; Kabiruddin, 2000
<i>Muqwwi-e-Aza</i> (Viscera tonic)	Ghani, ynm
<i>Muqawwi-e-Azam</i> (Bone tonic)	Ghani, ynm
<i>Muqawwi-e-Bah</i> (Aphrodisiac)	Ghani, ynm; Kabiruddin, 2000; Hakeem, 2002; Kirtikar and Basu, 2005 [16]; Nadkarni, 2007 [18].
<i>Muqawwi-e-Mufasil</i> (Joint Tonic)	Ghani, ynm
<i>Muqawwi-e-Sha'ar</i> (Hair tonic)	Kirtikar and Basu, 2005 [16]
<i>Mufatteh sudad</i> (Deobstruent)	Ghani, ynm
<i>Maghri</i> (Emmoilent)	Ghani, ynm; Kabiruddin, 2000; Kirtikar and Basu, 2005 [16]; Kirtikar and Basu, 2005 [16]
<i>Mufattil-e-Hisar</i> (Lithotriptic)	Ghani, ynm
<i>Mufatteh</i> (Exhalarant)	Ghani, ynm

<i>Musammin-e-Badan</i> (Weight gain)	Ghani, ynm; Kirtikar and Basu, 2005 ^[16] ; Kabiruddin, 2000; Ghulam, 2007; Hakeem, 2002
Mushtahi (Appetiser)	Ghani, ynm
<i>Mudir-e-Haiiz</i> (Emmenagogue)	Ghani, ynm; Hakeem, 2002; Kirtikar and Basu, 2005 ^[16] ; Ghulam, 2007; Nadkarni, 2007 ^[18]
<i>Mawallid-e-Mani</i>	Hakeem, 2002; Ghulam, 2007
<i>Mawallid-e-Labn</i> (Lactagogue)	Kirtikar and Basu, 2005 ^[16] ; Nadkarni, 2007 ^[18]
<i>Mulayyin</i> (Laxative)	Ghani, ynm; Ghulam, 2007; Kirtikar and Basu, 2005 ^[16] ; Nadkarni, 2007 ^[18]
<i>Mudir-e-Baul</i> (Diuretic)	Ghani, ynm; Kirtikar and Basu, 2005 ^[16] ; Nadkarni, 2007 ^[18]
<i>Musakkin</i> (Analgesic)	Kabiruddin, 2000; Ghulam, 2007; Nadkarni, 2007 ^[18]
<i>Qabiz-e-Ama</i> (Astringent to the bowel)	Kirtikar and Basu, 2005 ^[16] ; Ghani, ynm
<i>Qatil-e-Deedan</i> (Anthelmintic)	Ghani, ynm

Therapeutic Uses

Table 2: (Therapeutic Uses of *Kunjad*)

Clinical Indication	Reference
<i>Aatishak</i> (Syphilis)	Kirtikar and Basu, 2005 ^[16] .
<i>Ahraq</i> (Burn)	Ghani, ynm; Kirtikar and Basu, 2005 ^[16] ; Ibn Baitar, 1999 ^[12] .
<i>Azm-e-Tihal</i> (Splenomegaly)	Kirtikar and Basu, 2005 ^[16] ; Ghani, ynm
<i>Amraz-e-Riatein</i> (Lung diseases)	Ghani, ynm; Kirtikar and Basu, 2005 ^[16] .
<i>Amraz-e-Chashm</i> (Eye diseases)	Ghani, ynm; Kirtikar and Basu, 2005 ^[16] .
<i>Amraz-e-Uzn</i> (Ear diseases)	Kirtikar and Basu, 2005 ^[16] ; Ibn Baitar, 1999 ^[12] .
<i>Bars</i> (Leucoderma)	Ghani, ynm
<i>Bahrapan</i> (Deafness)	Ghani, ynm
<i>Bhagander</i>	Ghani, ynm
<i>Bawaseer</i> (Haemorrhoids)	Hakeem, 2002; Kabiruddin, 2000; Kirtikar and Basu, 2005 ^[16] ; Ghani, ynm; Ghulam, 2007; Nadkarni, 2007 ^[18] .
<i>Dard-e-sar</i> (Headache)	Ghani, ynm; Ibn Baitar, 1999 ^[12] .
<i>Daad</i> (Eczema)	Ghani, ynm
<i>Falij</i> (Paralysis)	Kabiruddin, 2000
<i>Ganj</i> (Baldness)	Ibn Baitar, 1999; Ghani, ynm; Kabiruddin, 2000
<i>Hudar</i> (Rheumatism)	Ghani, ynm; Kirtikar and Basu, 2005 ^[16] .
<i>Is'hal</i> (Diarrhoea)	Kirtikar and Basu, 2005 ^[16] ; Nadkarni, 2007 ^[18] .
<i>Inteshar-e-Shaar</i> (Hair Falling)	Ghani, ynm
<i>Juzam</i> (Leprosy)	Ghani, ynm
<i>Kharish</i> (Itching)	Ghani, ynm; Nadkarni, 2007 ^[18] .
<i>Mouch</i> (Sprain)	Ghani, ynm
<i>Laqwa</i> (Fascial palsy)	Kabiruddin, 2000
<i>Menorrhagia</i>	Kirtikar and Basu, 2005 ^[16] .
<i>Qurooh wa Zakhm</i> (Ulcer and Wound)	Ibn Baitar, 1999 ^[12] .
<i>Suaal</i> (Cough)	Ghani, ynm; Kabiruddin, 2000; Ghulam, 2007; Hakeem, 2002; Nadkarni, 2007 ^[18] .
<i>Sura'</i> (Epilepsy)	Ghani, ynm
<i>Shozish-e-Baul</i> (Burning Micturation)	Kirtikar and Basu, 2005 ^[16] .
<i>Waja-ul-Uzn</i> (Earache)	Ghani, ynm
<i>Zeequnnafs</i> (Asthma)	Ghani, ynm; Kabiruddin, 2000; Kirtikar and Basu, 2005 ^[16] .

Botanical Description

Habit and habitat

This small bush is indigenous to India, Baluchistan, and Waziristan and extensively cultivated in the warmer region, probably a native to tropical Africa. It occurs from August to December. Flowering takes place during October to December and fruiting from December to January. (Anonymous, 2007; Kirtikar and Basu, 2005^[16]; Nadkarni, 2007)^[3, 18].

Plant description

Scientific classification

Kingdom : Plantae
Order : Lamiales
Family : Pedaliaceae
Genus : *Sesamum*
Species : *indicum*

Erect 0.3-0.9 m high, more or less foetid and glandular,

usually also pubescent. Leaves simple above, lanceolate or oblong or upper most linear and alternate, lower opposite often lobed or pedatisect. Intermediate usually ovate and gashed or toothed. Flowers purple or whitish with purple or yellow marks, suberect or drooping, 2.5-3.2 cm long, pubescent. Sepals narrow lanceolate, 5-6.4 mm, hairy. Capsule 2.5 cm long, oblong, bluntly 4 gonous, erect, dehiscent from above downwards but rarely to the base. Seed grey or black, flattened ovate in shape, smooth or reticulate, 2.5 to 3 mm long and 1.5 mm broad, one side slightly concave with faint marginal lines and an equally faint central line; taste, pleasant and oily. (Anonymous, 2007; Kirtikar and Basu, 2005^[16]; Nadkarni, 2007)^[18, 3].

Microscopic examination

Testa of seed shows single layered palisade-like, thin-walled, yellowish coloured cells, and the rest of the testa composed of collapsed cells; endosperm 3 layered, rarely 2 layered, consisting of cellulosic polygonal cells of parenchyma

containing fixed oils and small aleurone grains; cotyledons two, externally covered with thin cuticle; single layered epidermal cell, followed by a single row of palisade-like cells; rest of the tissues consist of polygonal, parenchyma cells containing fixed oil and aleurone grains.

Powder: Blackish coloured; shows palisade-like cells in surface view, parenchyma cells, aleurone grains and oil globules.

Physicochemical studies

Physical constants

	Values
Foreign matter	not more than 2 %
Total Ash	not more than 9 %
Acid-insoluble ash	not more than 1.5 %
Alcohol-soluble extractive	not less than 20 %
Water-soluble extractive	not less than 4 %
Fixed Oil	Not less than 35 %

(Anonymous, 2008; Anonymous, 2007)^[4, 3].

Pharmacological activity

Anti-inflammatory and antipyretic study

Sesame oil produced significant antipyretic effect comparable to paracetamol. In a study, the sesame oil administered as dietary supplement produced analgesic, antipyretic and anti-inflammatory activities in animal models. The anti-inflammatory activity was assessed on the basis of paw edema inhibition induced by the injection of carrageenan (an edematogenic agent) into the subplantar region of the right hind paw of the rat. Their results showed that the sesame oil and sesamin inhibited the formation of pleural exudate and the leucocyte migration confirming the anti-inflammatory activity (Saleem *et al.* 2011; Monteiro *et al.*, 2014; Patel *et al.* 2012).

Antioxidant study

Sesame increases the recycling of vitamin E, improves liver functions and provides protection against alcohol-induced oxidative stress. Sesamin decreases cholesterol levels while increasing high-density lipoprotein levels. Sesame oil enhances hepatic detoxification of chemicals, reduces the incidence of chemically-induced mammary tumors, and protects against oxidative stress, which is involved in the pathogenesis of endotoxin intoxication. Oxidative stress may be caused by reactive oxygen intermediates (ROI). ROI, including singlet oxygen, nitric oxide (NO), hydrogen peroxide, and free radicals, all of which are important mediators of cellular injury and play a putative role in oxidative stress in endotoxin intoxication. The effects of ethanolic extract of sesame coat on oxidation of low-density lipoprotein (LDL) and production of nitric oxide in macrophages were investigated. The results showed that extract in the range of 0.01-0.8 mg/ml markedly inhibited copper-induced LDL oxidation and H₂O₂ induced cell damage that implies that ethanolic extract could exhibit a protective action on biomolecules and generation of inflammatory mediators *in vitro*. Clinically, it was found that sesame oil consumption helped in hypertensive patients remarkably reduced oxidative stress and simultaneously increases glutathione peroxidase (GPx), SOD and catalase activities (Sirato-Yasumoto *et al.*, 2001; Saleem *et al.*, 2011; Monteiro *et al.*, 2014; Patel *et al.*, 2012; Ide *et al.*, 2003; Wang *et al.*, 2007; Vishwanath *et al.*, 2012).

Antimicrobial Study

Sesame is naturally antibacterial for common skin pathogens such as Staphylococcus and Streptococcus, as well as common skin fungi such as athlete's foot fungus. As a throat gargle, it kills Streptococcus and other common cold bacteria. It helps sufferers of psoriasis and dry skin ailments. It is a useful natural ultraviolet protector. In a study, the results revealed that minimum inhibitory concentration (MIC) of sesame oil against Salmonella typhi is 10 µl/ml. However, for other organism the MIC values were in the range of 350-500 µl/ml. The sesame oil shows best antimicrobial activity and also equal with standard Kanamycin and also it shows highest zone of inhibition against S. typhi. It reported that sesame oil is found to have the antibacterial activity against Streptococcus mutans, Lactobacilli acidophilus and total bacteria (Anand *et al.*, 2008).

Antihypertensive Study

In a study, it is revealed that the sesamin and its active metabolites can induce antihypertensive effects in experimental animal models. A study in hypertensive patients indicated that sesame oil consumption remarkably reduced oxidative stress and simultaneously increased superoxidase dismutase, and catalase activities. These results support the hypothesis that sesame oil consumption may help to enhance antioxidant defense system in human beings. The investigators suggested that sesamin is a useful prophylactic treatment in hypertension and cardiovascular hypertrophy. In another study, among the hypertensive patients using nifedipine (calcium channel blocker) was compared along with other edible oils. Among the groups, sesame appeared to be promising against the blood pressure rise (Nakano *et al.*, 2006; Nakano *et al.*, 2002; Sankar *et al.*, 2005).

Lipid metabolism study

Considering the chemical composition, the dietary intake of sesame oil is expected to improve the condition preventing any postprandial lipemia or lipid oxidation. Although many reports are available concerning the effect of sesamin on lipid metabolism, but only a few studies using the intact sesame oil as a diet are available. It seems it possess lipid peroxidation and also the lipid profile. It is apparent that sesame rich in lignans more profoundly affects hepatic fatty acid oxidation and serum triacylglycerol levels. Therefore, consumption of sesame rich in lignans results in physiological activity to alter lipid metabolism in a potentially beneficial manner. Sesamol has been shown to reduce lipopolysaccharide-induced oxidative stress and upregulate phosphatidylinositol 3-kinase/Akt/endothelial nitric oxide synthase pathways (Chavali *et al.*, 1998; Ying *et al.*, 2011).

Wound healing study

Free radicals are generated at the site of injury, which are known to impair the healing process by causing damage to cellular membranes, nucleotides, proteins and lipids. In this context, several antioxidants, such as curcumin, vitamin E, have been reported to give protection against oxidative damage to tissues. The use of antioxidants has been shown to promote wound healing. Sesame oil extract has potential antioxidant activity which helps to prevent oxidative damage and promote the healing process. *Sesamum indicum* seeds and oil both promote wound healing in experimentally induced rats. Gel containing seeds or oil applied topically or administration of seeds or oil orally significantly promoted

the breaking strength, wound contraction and period of epithelialization in incision, excision and burn wound models (Fukuda *et al.*, 1986; Pascoe *et al.*, 1987; Kiran *et al.*, 2008).

Antiatherosclerotic study

Sesame oil could inhibit atherosclerosis lesion formation effectively, perhaps because of the synergistic actions of fatty acid and non saponifiable components. A modified form of sesamol (INV-403) to enhance its properties and assessed its effects on atherosclerosis. INV-403 is a novel modified lignan derivative that potently inhibits atherosclerosis progression via its effects on IKK2 and nuclear factor- B signaling (Bhaskaran *et al.*, 2006; Ying *et al.*, 2011).

Anticancerous study

Sesame oil has been found to inhibit the growth of malignant melanoma in vitro and the proliferation of human colon cancer cells. Sesame seed consumption increases plasma γ -tocopherol and enhances vitamin E activity, which is reported to prevent cancer and heart diseases. Cephalin from sesame seed has hemostatic activity. Historically, fiber is used as an antidiabetic, antitumor, antiulcer, cancer preventive, cardio protective and laxative. Myristic acid has cancer preventive capability and is found in sesame seed ranging from 328 to 1,728 ppm (Chakraborty *et al.*, 2008; Smith *et al.*, 1992).

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