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A COMPREHENSIVE REVIEW ON PHYTO-PHARMACOLOGICAL PROPERTIES OF *SESAMUM INDICUM* LINN.

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ABSTRACT: *Sesamum indicum* seeds have been used as a medicine since antiquity. Various parts of the plant have been used by traditional physicians. However the dried seed and oil are commonly used as Till in Unani Medicine. It (*Sesamum indicum*) is one of the oldest cultivated plants in the world, mainly grown for extraction of oil from seeds. Sesame belongs to the family Pedaliaceae and genus *Sesamum*, is a famous Indian drug used in a number of pathological conditions. The oil from sesame plant is an important ingredient in Unani remedies in India, because of the presence of bioactive components present in the seed including polyunsaturated fatty acids, phytosterols, tocopherols, vital minerals and unique class of phenylpropanoid compounds, namely lignans such as sesamin, sesamol, and sesamolin. Sesame lignans have various pharmacological properties including. Antioxidant activity, antimicrobial activity antiproliferative activity lowering cholesterol levels increasing hepatic fatty acid oxidation enzymes and show anti-hypertensive effects. This review is done to provide an electronic database regarding phyto-pharmacological properties of *Sesamum indicum* in particular with its description in Unani classical literature along with the recent research work done by many authors; so that future research work can be made at ease and it will help in revalidating scientifically the claimed activities of the drug mentioned in classical literatures and further exploration of any new therapeutic activity based on phytochemistry.

INTRODUCTION: The drug Kunjad Safaid consists of dried seeds of *sesamum indicum* Linn. Syn. *S. orientale* Linn, *S. luteum* Retz, *S. occidentale* (Pedaliaceae). An erect annual plant more or less foetid and glandular, the plant is indigenous to tropical Africa, and It (*Sesamum indicum*) is one of the oldest cultivated throughout the warmer parts of India.

Cultivated plants in the world, mainly grown for extraction of oil from seeds. Sesame belongs to the family Pedaliaceae and genus *Sesamum*. This genus consists of about ³⁶ species; out of this ¹⁹ species are native to Africa.

The oil from the sesame plant is an important ingredient in Unani remedies in India and is used in Chinese medicine to increase energy and prevent aging due to the presence of bioactive components present in the seed, including polyunsaturated fatty acids, phytosterols, tocopherols, vital minerals and unique class of phenylpropanoid compounds namely lignans such as sesamin, sesamol, and Sesamolin.



These phytochemicals provide defense mechanism against reactive oxygen species and increases keeping quality of oil by preventing oxidative rancidity. Sesame lignans have various pharmacological properties, including. Anti-oxidant activity, antimicrobial activity anti-proliferative activity lowering cholesterol levels increasing hepatic fatty acid oxidation enzymes and show anti-hypertensive effects ¹.

Traditionally, sesame is used in the treatment of hemorrhoids, dysentery, constipation, cough, amenorrhea, dysmenorrhea, and ulcer ². Sesame seeds have been used as medicine since antiquity. They are considered to possess antioxidant, anticancer, lactogoge, diuretic, hepatoprotective, and laxative properties. Sesame is very effective in lowering cholesterol levels due to its lignans content. Sesame seeds serve to boost the immune system of the body due to their phytosterol content. It is also believed that Til can help in the prevention of certain forms of cancers.

Taxonomic Classification:

Kingdom: Plantae
Division: Tracheophyta
Class: Magnoliopsida
Order: Lamiales
Family: Pedaliaceae
Genus: Sesamum
Species: Indicum

Vernaculars:

Arabic: Simsim, Samsam, khall, Duhn, Djyld-jylan. Bengali: Til, bhadutil, Kala-til, Chadu-til, Rakta-til, Sumsum. Bombay: Til, Tal, Krishna-til, Barik-til, Ashadi-til. Brazil: Gergelim, Jexelim. Burma: Hnan, Huonma, Goshya. Can: Valley-enne. Chinese: Hu Ma. Egypt: Semsem. English: Gingelly Seed, Seasme, Sesamum, Benne oil. French: Sesame, Benne, Jugeoline, jugioline. German: Sesom. Greek: Sesamoon. Gujarati: Tal, Tel, Mithutel, Til. Hindi: Til, Tir, Bariktel, Gingli, Krishnatel, Mitha-tel. Malaya: Kaylor; Ramoongie, Murinna, Gemunga. Kannada: Ellu. Malayalam: Karuella, Chitelu, Chitrallu, Ellu. Marathi: Til, Tila, Zilechatil. Orissa: Khasa, Rasi. Persian: Kunjad, Kunjed, Samsak. Punjabi: Til, Tili, Kunjad. Sanskrit: Tila, Snehapahla, Homadhanya,

Jatila, Papaghana. Tamil: Ellu, Yellu-cheddie, Nal-yennai. Telugu: Nuvvu, Nuvvulu, Ballanuvvulu, Manchi-noovay. Urdu: Til ^{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15}.

Morphology:

Macroscopic: The pear-shaped seed is 2-3 mm in length and about 1.5 mm in width, and white in colour with a smooth, slightly veined surface. The hilum lies at the pointed end of the seed from which the raphe extends as a line along the middle of one flat face up to the broader end. The seeds are oily with little endosperm surrounding a large embryo with two large planoconvex cotyledons hinged together by a small radicle. The seeds possess a sweet taste and a characteristic oily odour ¹⁶.

Microscopic: The microscopic examination of cross-section of seed reveals that the testa is prominently ridged. The outer epidermis consists of a single layer of thin-walled palisade cells. The radial walls are more or less wavy. These cells, apart from those found in testa ridges, contain cap-shaped cluster of calcium oxalate crystals in their outer halves. In testa section, these clusters some time disintegrate.

The rest of the testa consists of two layers of thin-walled some, which flattened cells containing single calcium oxalate crystal. A cuticle in the form of the yellow membrane, which is only 10 μ thick, links testa with the endosperm; the endosperm is made up of a cellulosic polygonal cell containing oil drops and small aleurone grains. The cotyledonary epidermis on inner sideshow a layer of palisade cells while the rest of the cotyledon is made up of usual isodiametric cells, and the contents of their cells are oil drops and aleurone grains with inclusion ¹⁶.

Powder: It is white, heterogenous, and oily with a sweet taste and a characteristic oily odour; the microscopic examination of powder reveals that it consists of long palisade cells, some crushed cells, endosperm parenchyma, isodiametric cotyledonary parenchyma, and an abundance of oil drops, small aleurone grains, and large calcium oxalate crystals. The microscopic identification of sesame seed residue can, however, be made only on the basis of characteristic testa epidermis with crystal lusters ¹⁶.

Geographical Distribution: It is an erect herb. The species is native to Africa. It is largely cultivated in India, China, Myanmar, Mexico, and South America for the oil from seeds. In India, it is mainly grown in Mp, Up., Ap., Rajasthan, TN, and Maharashtra. This species is often found wild on roadsides and wastelands¹⁷. The plant is widely cultivated in India, China, Japan, East Indies, West Indies and in the southern United States¹⁸. The plant is an annual herb, 1 m in height. *Sesamum* is cultivated in the plains and on elevation up to 1.200 m at a temperature of 21° and above. It requires a warm climate and cannot withstand frost, continued heavy rain or prolonged drought. It grows on light, well-drained soil which is capable of retaining adequate moisture. It thrives best on typical sandy loams. In Unani literature, it is a Kharif crop in most parts of India. Either a single crop or mostly as intercrop with hoursegram, buck-wheat and rainfed peddy,

Parts used Hasa' smustamala: Unani physicians mostly used its Seeds & Fixed oil

Mizaj Temperament: In Unani system of Medicine it believes that Unani drugs act by virtue of their inherent qualities (Kaifiyat) present in the drugs; hence they categorized them into four temperaments (Mizaj) viz. hot, cold, dry, and moist. Each one has a degree of temperament (darjat-e-mizaj) ranging from 1-4 degrees, accordingly the present drug *Sesamum indicum* is also attributed with its particular temperament. Some physicians described the temperament of Shajanah as Hot 1° & Wet 1°^{12, 14, 15, 19, 20}. In contrast, some say that it is of Hot 2° & Wet 2°^{5, 6, 16, 21, 22}.

Muzir Adverse Effects: Despite producing the beneficial effect in different diseases, *Sesamum indicum* also causes some harmful effects on various organs when it is used without processing (Tadbeer) as described by many authors. The drug produces toxicity such as Bati-ul- hazam, Musaddaa, Saqit-e-Ishteh^{5, 6}. Whereas according to some author it has toxic effect on eye. Saudawi Mizaj, Murakhi-e- meda, mufse-de- demagh-e-zaef^{6, 13, 14, 21}.

Musleh Correctives: Unani physicians have written many drugs that can be used to resolve the toxic effect caused by *Sesamum indicum*, which

include use of Honey and Biriyan,^{5, 6, 14, 15, 21}. Abkama, Abe-Lemu; Khall/Sirka with *Sesamum indicum*^{5, 6, 21}. That may alleviate its toxicity.

Afa'al Pharmacological Action: Muqawwi-e-Bah,^{5, 6, 12, 15, 19, 20, 21}. Dafe-e-Sua'al,^{5, 6}. Mudirr-e-Laban²³. Mudirr-e-Haiz,^{6, 12, 14, 15, 19, 20}. Mohallil-e-Waram-e-Haarra,^{5, 6, 14, 15, 19, 21}. Mohallil-e-Waram-e- Aasab,^{20, 24}. Musakkin-e- Alam^{6, 12, 21, 24}. Muwallid-e-Mani¹⁵. Mulayyin-e-Ama'a-wa-Miqaad,^{6, 19, 21}. Mulayyin-e-Jild,^{5, 14, 23}. MufattehSudade,^{5, 6, 21, 23}. Muqawwi-e- Sha'ar,⁶. Mutawwal-e-Sha'ar,^{19, 24}. Musammin-e-Badan,^{6, 13, 15, 21, 23}. Dafe-e- Takaan,¹⁵. Muqawwi-e- Gurda-wa-Masana,²⁴. Muwallid-e-S eham-e-Gurda^{21, 24}. Dafe-e -Sua'l Yabis^{5, 6, 15}. Habis-ud-Dam-e-Bawaseer^{6, 21, 22}. Dafe-e- Surf'a⁶. Mugarri/Agglutinant,^{5, 6, 14}. Dafe-e-Zeeq-un-Nafas,¹². Dafe-e-Qabz,⁵. Dafe-e-Suzish-e-Meda-wa-Meri,^{6, 21}. Dafe-e- Kharish,¹³. Mukhrij-e-Janin,^{6, 12, 14, 15, 19, 20, 21}. Musakkin / Temperative,^{6, 14}. Muzayyed-e-Mani,^{5, 6, 14, 21, 23}. Mukhrij-e-Hisat-e-Gurda,^{5, 6, 21}. Naf'a-e-Qulanj,⁵. Naf'a-e-SalsulBaul,^{5, 15}. Naf'a-e-Bawasir,^{5, 15}. Mulayyin-e-Shikam-wa-Amaa,^{5, 6}. Murattib,^{6, 13, 21}. Musleh-e-Akhlat-e-Saukhta-wa-Saudawi,⁶.

Istemat Unani Therapeutic Uses: Suaal-e-Yabis / Dry cough,^{5, 6, 13, 20, 21}. Suda'a-e-Ihteriqi,^{12, 14}. Amraz-e-Tasunnuj-e-Yabis,^{6, 12, 13, 21}. Amraz-e-Sadarwa Riya,^{5, 6, 12, 20, 21}. Qurhe-e-Riya-wa-Sadar,^{6, 12, 21}. Safa'a / Ganj,^{5, 6, 12}. Zeeq-un-Nafas,^{5, 6, 14, 21}. Jarb-e-Yabis,⁶. Shiqaq-e-Jild,^{6, 20, 21}. Dama / Asthma^{5, 12, 14}. Qulanj,^{6, 21}. Harqat-ul-Baul,^{6, 21}. Haraq,^{5, 12, 19}. Kharish-e- Damvi-wa-Balghami,^{6, 21}. Khushunat-e-Halaqwa Badan^{6, 12, 20, 22}.

Ethno-pharmacological Description: Aphrodisiac,^{1, 3, 11}. Demulcent,^{1, 2, 3, 11}. Diuretic,^{1, 2, 3}. Emmenagogue,^{1, 3, 11}. Emollient,^{1, 3, 11}. Lactagogue,^{1, 3}. Laxative^{1, 2, 11}. Astringent,³. Tonic,³. Cooling agents,³. Nourishing,³. Styptic,²⁵. Suppurative Properties,²⁵.

Ethno-Pharmacological Uses: Constipation,^{1, 2}. Cough (Dry),^{1, 3, 11}. Dysentery,^{1, 2, 11}. Amenorrhoea,¹. Dysmenorrhoea¹. Asthma³. Abortion¹. Piles,^{1, 2, 3}. Burns,^{1, 11}. Scalds,^{1, 11}. Scorpion sting, Nadkarni, 1982. Ulcer, Kirtikar and Basu, 1995, Nadkarni, 1982; Dymock, 1972; Hair growth, Nadkarni, 1982, Kirtikar and Basu, 1995.

Psoriasis, Nadkarni, 1982. Prurigo,¹. Diseases of lung,³. Leucoderma,¹. Diarrhea,³. Gouty,³. Joints diseases,³. Eye diseases,³. Urinary concretion,^{3,11}.

Phyto-Chemistry: A flavonoid glucoside – pedaliin (0.3%), mp. 2540 – isolated from leaves and structure determined²⁶. A new antioxidant – sesamol – along with sesamol and γ -tocopherol isolated from seeds and its crystal structure determined²⁷.

Two new phenylethanoid glycosides (I and II) and three new triglycosides (III, IV, and V) isolated from whole plant and characterized; in addition, acteoside and its isomer, decaffeoylacteoside, cistanoside F, campneoside I camponeoside II also isolated, seed oil afforded new lignanphenol – sesaminol – together with pinoresinol and sesamol, in addition, three new sesaminol glucosides (VI, VII, and VIII) isolated from seeds, sesamol, sesaminol and pinoresinol isolated from seeds and found to exist as their glucosides; other lignan glucosides isolated and characterized as pinoresinol-4'-o- β -D-glucosyl (1-6)- β -D-glucoside (KPI) and pinoresinol-4'-o'- β -D-glucosyl (1-2)- β -D-glucoside (KP2), another lignan triglycoside, KP3, isolated from seeds and its structure established as pinoresinol-4'-o- β -D-glucosyl 1 (1-2)-o- [β -Dglucopyranosyl (1-6)]- β -D-glucoside, sesamol and sesamin identified in seed oil by GC-MS and HPLC, isolation of two triterpenes- esculentic acid and 3 β -(trans-p-coumaroyloxy)-2 α , 23-dihydroxyurs-12-en-28 oic acid (IX) – from callus cells²⁸.

The GC/MS result of the chloroform extract of the seed showed that it contained six compounds of mostly fatty acids with different peaks and percentage composition, as n-Hexadecanoic acid (C₁₆H₃₂O₂), Cis, cis-^{9, 12}- Octadecenoic acid (C₁₈H₃₂O₂), Cis-9- Octadecenoic acid (C₁₈H₃₄O₂), n-Octadecanoic acid (C₁₈H₃₆O₂) 1,2 benzene dicarboxylic acid, dioctyl ester (C₂₄H₃₈O₂), 9-Octadecenoic acid^{2, 3} dihydroxypropyl ester (C₂₁H₄₀O₄)²⁹. Anthraquinone derivative isolated from seed and roots of *Sesamum indicum* were named anthrax sesamone A, B, C, D, E and anthrax sesamone F, its structure was determined to be (Z)-6, 7-dihydroxy 12-(6-hydroxy-4-methyl-3-pentenyl)³⁰. Roots of sesame indicum were reported to possess, hydroxy sesamone and^{2, 3}.

epoxysesamone and a chlorinated red naphthoquinone pigment, named chlorosesamone³¹. 2-Geranyl-4, 4-naphthoquinone was isolated from the hairy root culture of *Sesamum indicum*. Sesamol diglucoside was isolated from defatted sesame seed flour. The seed contain the lignans pinoresinol and lariciresinol³².

Pharmacological Studies:

Analgesic Activity: Analgesic activity of ethanolic extract of *Sesamum indicum* has been tested by the acetic-induced writhing model in mice. The study concluded that the extract produced a significant writhing inhibition at the doses of 500 mg/kg, which is comparable to the standard drug Ibuprofen at dose of 50 mg/kg³³.

Antioxidant Activity: The ethanolic extract of white and black varieties of *Sesamum indicum* were assayed for their antioxidant activities, the result show that the sesame seed extracts possess high antioxidant activity and that the white variety elicit better antioxidant than the black one³⁴. The antioxidant activity of ethanolic extract of *Sesamum indicum* was investigated in vitro assays and compared with ascorbic acid. The result showed 92.00% inhibition and 56.00% reduction ability in hydrogen donation and reducing power assays³³. A study in hypertensive patients showed the remarkably reduced oxidative stress and simultaneously increased GPx, SOD, and catalase activities, and concluded that sesame oil have better protection over blood pressure, lipid profiles and lipid per oxidation and increase enzymatic and nonenzymatic antioxidants³⁵.

The antioxidant and free radical scavenging activities of sesamol have been reported using a nanosecond pulse radiolysis technique³⁶. Sesame oil exhibited a decrease in lipid peroxidation by inhibiting the generation of reactive oxygen free radicals and also attenuated multiple organ failure triggered by endotoxin lipopolysaccharide in rats,³⁷. Furthermore, sesame elevated the glutathione peroxidase super oxidase dismutase and catalase activity in rodents under the various condition of oxidative stress³⁸. The antioxidant activity of methanolic sesame oil extract as measured by DPPH and ABTS radicals is scavenging potential, and inhibition of the degradation of β -carotene was significantly higher than that of the reference

antioxidant, α -tocopherol. The antioxidant activity was as measured by ABTS and DPPH, radicals is dose dependant and no pro oxidation activity was exhibited even at the highest level tested³⁹. Feeding sesame lignans to rats have been shown to reduce Fe^{2+} induced oxidative stress. Compound with those fed groundnut oils, sesame oil-fed rats had lower levels of hepatic thiobarbituric acid-reactive substances, serum glutamate oxaloacetate transaminase (SGPT) activities, indicating protection against Fe-induced oxidative stress *i.e.*, antioxidant action⁴⁰. The prophylactic effect of aqueous extract of *Sesamum indicum* on ethanol-induced toxicity in rats was investigated. The results of the present study indicate that *S. indicum* possesses antioxidant and hepato protective properties⁴¹.

Hepato-Protective: Ethanolic extract of *Sesamum indicum* seeds has been shown to possess a significant hepato protective effect. The results show that sesame normalized the elevated level of Serum glutamate oxaloacetate transaminase, serum glutamate pyruvate transaminase, alkaline phosphatase, acid phosphatase, total protein, albumin, and total bilirubin⁴². The hepatoprotective activity of methanol extract of seeds of *Sesamum indicum* was investigated in CCl_4 induced liver injury in rats. The result showed a significant reduction in level of ALT, AST, and ALP when compared to the CCl_4 control group⁴³. Cenqiz, *et al.*, have investigated the hepatoprotective effect of *Sesamum indicum* in CCl_4 -induced experimental damage. The result showed that Biochemical and his pathological findings in the sesame fixed oil-treated group were not significantly different from the CCl_4 group.

They have concluded that the sesame did not show a hepato protective effect in CCl_4 -induced liver toxicity⁴⁴. The hepatoprotective activity of ethanolic extract of *Sesamum indicum* Linn seeds against Paracetamol-induced liver damage in rats was investigated and concluded that extract of *Sesamum indicum* has the potential to protect the liver from toxic substances⁴⁵. Hepatoprotective role of sesame oil against lead acetate induced hepatotoxicity in albino mice was investigated, and the result concluded that Sesame oil showed effective hepatoprotective action against acetate induced hepatotoxicity in albino mice⁴⁶.

Anti-bacterial Activity: *In-vitro* anti-bacterial activity of sesame oil against dental caries causing bacteria was determined Streptococcus mutans and Lactobacillus acidophilus were found to be moderately sensitive to the sesame oil. The result revealed that sesame oil has the anti-bacterial, activity against *S. mutans*, Lactobacilli, and total bacteria⁴⁷. The antimicrobial activities of Ethanolic and aqueous leaf extracts were screened for antimicrobial activities on some pathogens; the result revealed that ethanolic extract strongly inhibited the growth of *E. coli*, while it mildly inhibited the growth of *K. pneumonia* and *S. typhi*, *S. aureus* growth was not inhibited.

The aqueous extract had no inhibition on the microorganisms tested⁴⁸. The biological activities of sesame lignans and sesamol were studied by comparing their antioxidant properties as well as antimicrobial activity. The order of radical scavenging, reducing power ability as well as antimicrobial activity of the three compounds was sesamol > sesamin > sesamol⁴⁵. Methanol and aqueous extract of different parts (seeds, roots, and leaves) of *Sesamum indicum* L. were screened to detect *in-vitro* antioxidant and thiobarbituric acid and antimicrobial activity. The results of different parts of *S. indicum* showed promising antimicrobial and antioxidant activity in methanol extract instead of aqueous extracts⁴⁹. The anti-microbial activity of hot water and cold water and ethanol extracts of the sesame seeds tested against some selected micro-organisms which include *E. coli*, *S. aureus*, *P. mirabilis*, *P. aeruginosa* and *C. albicans*. The result revealed that ethanolic extract had inhibitory effects on all microorganisms except *Pseudomonas aeruginosa*²⁹. The methanolic extract of *S. indicum* showed good anti-bacterial and antioxidant activities which may be due to the presence of phenolic contents such as lignans and other secondary metabolites⁵⁰. *In-vitro* antimicrobial activity of the isolated compounds from the petroleum spirit, chloroform and methanol crude leaf extracts of the white species of the leaf of the *Sesamum indicum* was investigated and concluded that the only pure isolates from petroleum spirit and chloroform fractions showed activity against *Bacillus cereus*, *Coryne bacterium* ulcerans, and *E. coli*⁵¹. Anti-cancer activity: Sesame seeds and their lignans have been studied for possible anticancer

effects both directly and indirectly. Research has shown that the *Sesamin lignan* can be converted by intestinal microflora in humans to the mammalian lignans, enterolactone, and enterodiols, which may have protective effects against hormone-related diseases such as breast cancer⁵². In another study, the sesamol lignan was found to stop the growth and induced apoptosis of cancer cells⁵³. A further study in 220 premenopausal women reported that the risk of breast cancer fell with increasing enterolactone concentrations⁵⁴. In a recent study, it was shown that sesamin arrested cell growth in the early phase of the cell cycle called G1, which promotes cancer cell growth⁵⁵. The effects of alcoholic extract from *Sesamum indicum* flower on tumour growth in tumorigenic mouse, and on the weight of immune organs showed inhibiting effect on tumour growth and had no distinct effect on the weight of thymus and spleen in mice⁵⁶. Sesame oil has been found to inhibit malignant melanoma in vitro and the proliferation of human colon cancer cells⁵⁷.

Anti Atherosclerosis Activity: Sesame oil has been found to inhibit atherosclerosis lesion formation effectively, perhaps because of the synergistic action of fatty acid and nonsaponifiable components⁵⁸. 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- κ B signaling⁵⁹.

Anti-fungal activity: Chloro sesamol, hydroxysesamol, and 2, 3-epoxysesamol were isolated from the roots of *Sesamum indicum* and elicited antifungal activity against *Cladosporium flavum*,⁶⁰. Metabolites were extracted from leaves, stem and roots against fungal pathogenic fungi *Macrophomina phaseolina*, *Alternaria sesame*, and *Fusarium oxysporum*. Most of the extracts had inhibitory effect on all the tested fungal species, some of the root extracts supported the growth of *A. sesame* whereas some leaf extracts enhanced the growth of *F. oxysporum* as compared to the control⁶¹.

Hypo-lipidemic Activity: Animal studies revealed that sesame lignans reduce cholesterol levels, both by inhibiting absorption and by decreasing the

synthesis of cholesterol. Significant reduction in serum cholesterol concentration was noticed with Sesamin supplementation in cholesterol-enriched diet-fed rats. Furthermore, a significant decline in the activity of liver microsomal 3-hydroxy-3-methylglutaryl Coenzyme A reductase (HMG-CoA reductase), was observed.

Moreover, dietary sesamin remarkably decreased mRNA of HMG-CoA reductase and LDL receptor, as well as mRNA level and protein content of SREBP-1 in rat liver⁶². Some findings indicate ligand property of sesamin for SREBPs and PPARs,⁶³.

Asgary *et al.*, have been investigated the antihyperlipidemic effects of sesame in a high-fat-fed rabbit model; the result reveals that supplemented with sesame oil were found to have lower circulating concentration of TC, LDL-C, HDL-C, SGOT and SGPT. Supplementation with sesame oil, but not sesame seed, can ameliorate serum levels of lipids and hepatic enzymes in rabbits under a high-fat diet⁶⁴.

Anti-hypertensive Activities: In a study, it is revealed that the sesamin and its active metabolites can induce anti-hypertensive effects in experimental animal models⁶⁵. A study in hypertensive patients indicated that sesame oil consumption remarkably reduced oxidative stress and simultaneously increased GPx, super oxidase dismutase, and catalase activities. The investigators suggested that sesamin is a useful prophylactic treatment in hypertension and cardiovascular hypertrophy⁶⁶. In another study, among the hypertensive patients using nifedipine was compared along with other edible oils. Among the groups, sesame appeared to be promising against the blood pressure rise³⁵.

Gastroprotective Activities: In animal studies, the effect of sesame seed extract in the alendronate-induced gastric ulcer in adult Wistar rats. It was examined and showed that the sesame extract was given therapeutically at doses of 0.5 and 1 mg/kg showed comparable results with that of pantoprazole 30 mg/kg. Both the doses of sesame, 0.5 and 1 mg/kg showed similar gastroprotective activity against alendronate-induced gastric ulcers in Wistar rats and concluded the protective effects

of Sesame against alendronate-induced gastric ulceration⁶⁷.

DISCUSSION: *Sesamum indicum* has been used as a medicine since antiquity and has been reported in many classical literatures of traditional medicines like Ayurveda, Unani, Siddha, homeopathy as well as in the Chinese system of medicines for many years. Therapeutically, it is mentioned to be used as antioxidant activity, antimicrobial activity antiproliferative activity lowering cholesterol levels increasing hepatic fatty acid oxidation enzymes, and show anti-hypertensive effects.

The drug is widely cultivated in India and many others countries for its pharmacological effects. Going through the present review of Unani literature, it was found that a large number of the therapeutic effects of *Sesamum indicum* have been mentioned. Some of the uses have been revalidated scientifically by many researchers during the late 50s, however, there are certain beneficial uses that are claimed by Unani scholars as its efficacy in many actions like Muqawwi-e- Bah, Dafe-e-Sua' *et al.*, Mudirr-e-Laban, Mohallil-e-Waram-e-Haarra, Musammin-e-Badan, Muwallid-e-Mani, Musakkin-e-Alam, MufattehSudade, Muqawwi-e- Sha'ar, Muqawwi-e- Gurda-wa-Masana, that are still remained unexplored. Keeping in view of the significance of these claims, it is need of h to revalidate these important claims on a scientific basis. These pharmacological effects should be correlated to its phytochemical constituents present in the drug.

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