

Review of *Sesamum indicum* with special reference to Siddha Medicine.

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ABSTRACT

In today's world, though human race have seen several advancement in the field of medicine and there is also undeniable increase in new health complications and diseases. Almost the root of every diseases relates directly or indirectly on the food consumed. So it becomes necessary for us to understand the medicinal value of natural food resources, herbs and plants etc to ensure healthy generations ahead.

Siddha system of medicine is the most primitive medical system. This system was formulated and established about more than 25,000 years back by the eminent persons called Siddhars.. The main aim of this system is "Prevention of Disease". As it well said Prevention is better than cure " .

This Review is presented to enlighten the medicinal values, traditional usage, different facts on Sesame and insisting on further research to unravel new medicinal discoveries and solutions. The Review shares insight over the Origin & Distribution, habitat, properties, medicinal use, constituents, facts and its Analysis, Health benefits, traditional usages across different countries, Pharmacological and Clinical trials.

The facts over its various properties like antioxidant, antihypertensive, antihyperglycaemic and other analysis provides strong hope on its role in preventing/combating fatal diseases. It concludes by emphasizing the need for future research

over sesame which possess high probability in preventing some of the world' s deadly diseases.

KEYWORDS

Siddha medicine, Sesame seeds, Tilla, *Ellu*

INTRODUCTION

SESAMUM INDICUM is a flowering plant belongs to the family pedaliaceae and it is one of the most popular oil seeds crop. India, Sudan, burma and China are chief producers of Sesame seeds. It plays critical role in human nutrition. The world had harvested 4.2 million metric tonnes of sesame seeds in 2013, with India and China as the largest producers. Sesame oil places second rank after olive oil as nutritional value. Oil is extracted from the seeds and remaining part is used for edible purpose.

CLASSIFICATION

Kingdom : Plantae
Order : Lamiales
Fam : Pedaliaceae
Genus : Sesamum
Species : indicum

Sesamum indicum Vernacular Names

Synonym : Sesamum indium .L
Sanskrit : Tila
Local names : Hindi - Til, Guj - Tal.
Tamil : Ellu, Mal - karuthiellu
Telugu : Nuvvulu
Trade name : Sesame, Gingelly
Propagation : by seeds

Origin and Distribution

Sesamum indicum L. is one of the oldest cultivated plants in the world. It was a highly prized crop of Babylon and Assyria at least 4000 years ago. Today, India and China are the world's largest producers of sesame, followed by Myanmar, Sudan, Mexico, Venezuela, Uganda, Turkey and Ethiopia. Cultivated throughout India in the plains or up to an altitude of 1,200m mainly for oil seed.

Habitat

An erect pubescent annual up to 90cm in ht, branching from the base, leaves large, thin, lower, ones lobed, sparsely hairy, uppermost linear or intermediate usually ovate toothed, flowers white pink or purplish with yellow marks in racemes in the leaf axils. Fruits quadrangular, oblong compressed capsules deeply 4-grooved dehiscent from above of half way down. Seeds, many, black, brown or white.

Parts Used

Roots, leaves, seeds, oil.

Properties and Uses

Roots and leaves are emollient. A decoction of them forms a good hair wash which will promote hair growth and will blacken them. The leaves are useful in dysentery, cholera, vitiated conditions, kaphauropathy, rephropathy, ophthalmopathy, dermatopathy.

The seeds are sweet, astringent, bitter, acrid, emollient, thermogenic, aphrodisiac, laxative, galactagogue, digestive and hair restorer of tonic. They are useful in hemorrhoids, unless burns, dysentery, dermatopathy, migraine, alopecia, obesity. In medicated oil, sesame oil forms a fat soluble medium. The oil is bitter, astringent, sweet, thermogenic, digestive, anthelmintic, constipating. Emollient of it is good for ophthalmopathy, burning sensation of legs, gonorrhoea, otalgia, cephalalgia, emaciation. Externally it is used for dryness of skin of leucoderma.

Though black, brown and white varieties of sesame seeds are available, the black one is believed to be the best for medicines.

Varieties Three varieties of sesamum seeds are found:black,white and red or brown. The black variety is the most common and yields the best quality of oil and is also the best suited for medicinal purposes. But the white variety is richer in oil.

Action

Seeds are laxative,emollient and demulcent;diuretic,nourishing,lactagogue and emmenagogue. Leaves are demulcent.

Medicinal Uses

Sesame seeds are considered emollient, diuretic, lactagogue of Nourishing tonic. They are said to be helpful in piles, a paste of the seeds mixed with butter being used in bleeding piles.

A decoction of the seed is said to be an emenagogue of is also given in cough. The oil is employed as vehicle for injections of also used as emollient of demulcent. Seeds are specially useful in dysentery,scorpion sting and constipation,taken in decoction or as sweetmeats. A compound decoction of the seeds with linseed is used in cough and in aphrodisiac. Ground to a paste with water,they are given with butter for bleeding piles;if taken in large quantities,they are capable of producing abortion.



Constituents

Seeds contain fixed oil 50 to 60 p.c.,(white variety 48 p.c.,black and red varieties about 46 p.c).

Analysis

Varieties	Moisture	Oil
1.Black Til	2.0 to 5.2 p.c	44.6 to 56.9 p.c
2.Red Til	-	45.6 to 55.5 p.c
3.White Til	2.0 to 4.4 p.c	44.9 to 58.2 p.c

Seeds also contain protein 22p.c., carbohydrates 18 p.c.,mucilage 4 p.c.,woody fibre 4 p.c.,and 4.8 p.c. Oil contains 70 p.c. of liquid fats consisting of the glycerides of oleic and linoleic acids and 12 to 14 p.c. of solid fats,stearin,palmitinc and myristin;a crystalline substance sesamin and a phenol compound sesamol.

Traditional Medicinal Uses

- **Arabic countries:** Dried seeds are used externally in the form of a plaster as a contraceptive inUnanimedicine. The seed oil is applied on the glans penis before coitus to avoid conception.
- **China :** Hot water extract of the seed is taken orally for impotence. Seed oil is taken orally for tuberculosis.
- **South Africa:** Hot water extract of aerial parts is taken orally by the Bantu as an aphrodisiac. Hot water extract of leaves is taken orally as a remedy for malaria.
- **United States:** Dried seeds are eaten as an emmenagogue. Hot water extract of the seed oil is taken orally to promote menstruation.
- **South Korea:** Hot water extract of seed is taken orally to induce menstruation. Hot water extract of dried seed is taken orally as an abortifacient and emmenagogue

Sesame seeds nutrition facts

One of the initial oil seeds known to humankind, sesame seeds have been widely employed in culinary as well as in traditional medicines for their nutritive, preventive, and curative properties. Sesame are an important sources of phyto-nutrients such as omega-6 fatty acids, flavonoidphenolic anti-oxidants, vitamins, and dietary fiber with potential anti-cancer as well as health promoting properties.

Sesame plant is a tall annual herb in the Pedaliaceae family, which grows extensively in Asia, particularly in Burma, China, and India. It is also one of the chief commercial crops in Nigeria, Sudan and Ethiopia. Scientific name: *Sesamum indicum*.



Sesame plant requires well-drained sandy soil and tropical environment to flourish. It grows about 5 feet in height and bears plenty of pink-white foxglove type flowers. The pods appear soon containing white, brown, or black seeds depending upon the cultivar type, arranged in vertical rows inside thin sacs. Each pod (2-5 cm in length) is a long rectangular box like capsule with deep grooves on its sides. A single pod (1 to 2 inches in length) may contain up to 100 or more seeds.

Sesame seeds are small, almost oblate in shape. Toasted sesame feature pleasant, nutty flavour.

Health benefits of sesame seeds

- Sesame seeds, due to their rich flavour and crunch are used as healthy food all over the world. Fats constitute much of their calories. They are also packed with health benefiting minerals, nutrients, vitamins and anti-oxidants. 100 grams of sesame seeds can provide up to 573 calories.
- The seeds are a rich source of mono unsaturated fatty acid, oleic acid which constitutes up to 50% of their fatty acids. The increase in HDL, the good cholesterol and the decrease in LDL which is the bad cholesterol can be facilitated by oleic acid. Such diets rich in mono unsaturated fats provide a healthy serum lipid profile and may prevent coronary heart disease.

- Sesame seeds prove valuable as a source of dietary protein which is comprised of amino acids of fine quality and efficient in the growth of children. Up to 18 grams of protein can be provided by 100 grams of seeds.
- Many health benefiting compounds such as sesamol (3, 4-methylene-dioxyphenol), sesaminol, furyl-methanthiol, guajacol (2-methoxyphenol), phenylethanthiol and, vinylguacol, furaneol and decadienal are present in sesame seeds along with phenolic anti-oxidants like Sesamol and sesaminol in order to stave off harmful free radicals from the human body.
- 100 g of sesame consists of 97 µg of folic acid, which comprises about 25% of the daily recommended intake. Folic acid is necessary for DNA synthesis and may prevent neural tube defects in the newborns when given to expectant mothers during their peri-conception period.
- Another B-complex vitamin found abundantly in sesame is Niacin. 100 grams of sesame seeds provides about 4.5 mg or 28% of daily-required levels of niacin. Niacin enhances GABA activity inside the brain, thus helping to reduce anxiety and neurosis.
- The sesame seeds have a rich concentration of Calcium, zinc, iron, manganese, magnesium, selenium especially, copper. These essential minerals play a significant role in bone mineralization, synthesis of enzymes, blood cell formation, hormone production and regulates cardiac and skeletal muscle activities.

Just a handful of sesame a day provides enough recommended levels of phenolic anti-oxidants, minerals, vitamins and protein

Table 1: List of Minerals in seeds

Iron	10 mg
Sodium	45 mg
Potassium	460 mg
Calcium	785 mg
Magnesium	354 mg

Table 2: Nutrients content in sesame seeds (100gm)

Energy	2930kJ (565kcal)
Carbohydrate	10.2 g
Fiber	11.2 g
Lipids	50.4 g
Minerals	5.3 g
Protein	17.7 g
Water	5.2 g

Table 3: List of Lipids present in sesame seeds

Lipid	Amount
Linoleic acid	670 mg
Linolic acid	18.7 g
Oleic acid	19.9 g
Palmitic acid	5700 mg
Salicylic acid	230µg
Stearic acid	1600 mg

IN SIDDHA ASPECT-Ellu

Family : Pedaliceae

Vernacular names :

English : Gingelly oil, Gingelly, Sesame.

Telugu : Nuvulu

Malayalam : Karuella

Kannada : Ellu

Sanskrit : Tilam

Hindi : Thil

It is a small plant cultivated widely in India. The seeds from the fruit are taken and dried to extract a kind of oil. This oil is known as Nallennai. It is also known as 'EllinNei'. In south India, this oil is used for cooking and hair and body oil. It is of three types namely, White, black and red sesame. Other types are Kaatellu, Sitrellu and Paerellu.

Used part : Leaves, Seeds of fruit.

Taste : Sweet.

Potency : Heat.

Type : Sweet.

Leaf:

It can be used as a Demulcent and an emollient.

Usage:

One or two green leaves are rinsed in cold water to obtain a gum. This can be used to wash wounded eyes.

One or two leaves are soaked in a glass of cold water and consumed twice a day or for seven days can cure Seedakazhichal.

Flower:

Skin flower is used to treat eye diseases.

Fruit and skin:

The fruit and skin are dried and burnt. The ash thus obtained on wounds can cure it.

Seed - Action:

It can act as a Emmenagogue, Stimulant, Tonic, diuretic, Galactagogue and laxative.

Character:

It can deactivate medicine. It can alleviate heat, tuberculosis and kabam. It can lead to hoarseness of voice. It gives good eyesight and strengthens the body. It also increases bleeding.

Usage:

When taken in heavy doses, It is said to create Abortion.

One sundaialavu of the seed paste when consumed along with butter can cure bleeding piles.

The seeds when grinded and boiled can be applied on cloth and bounded to cure them.

Oil:

It can be used as a Demulcent, Laxative, Nutritive and Emollient, strengthens body. It also used as cooking oil.

Character:

It can cause clarity of mind, cooling of the eyes, and it can also drive away eyes diseases, ear diseases and scabbies. It can also cure cough and removes dryness of the skin.

Usage:

The above mentioned oil when consumed in four teaspoons everyday can cure scabies and suppress cough.

It is mixed with egg whites and applied on pimples to cure the pain. The same mixture is applied on a cloth and bounded on both eyes and applied on the head and washed with cooled hot water continuously for three days can cure redness of eye diseases and headaches related to eye diseases.

It is mixed with egg yolks and is applied on burn wounds and itching regions to cure it. In siddha system of medicines, most of the medicinal oils contain sesame oil as preservative.

Sesame Oil cake:

It is a dry content obtained after the extraction of oil from the seeds.

It can cure diseases like tumour, tenderness, eczema and diabetic wounds.

Sesamum indicum –

Antioxidant activity

The antioxidant activity of ethanolic extracts of sesame coat (EESC) was investigated by Chang et al.(2002).The antioxidant activity (91.4 per cent) of 1.0 mg EESC was equal to 1.0 mg tocopherol (90.5 per cent) but was weaker than 1.0 mg butylatedhydroxyanisole (98.6 per cent) on per oxidation of linoleic acid. EESC showed an inhibitory effect against the formation of TBARS in a liposome model system. EESC at 10.0 mg exhibited a 94.9 per cent scavenging effect on DPPH radicals and marked reducing power, indicating that EESC acts as a primary antioxidant. The extracts, at a dose of 1.0 mg, showed a 50.0 per cent scavenging effect on the hydroxyl radical. EESC also exhibited a metal-binding ability. Sesamin and sesamol, the lignan substances were found in EESC, by HPLC analysis. In addition, chromatographic analysis demonstrated that phenolic compounds and tetranortriterpenoids, which had positive reactions with B-carotene, indicating antioxidant activity, are present in EESC. According to these results, termination of free radical reaction, metal-binding ability and quenching of active oxygen are suggested to be, in part, responsible for the antioxidant activity of EESC.

The free radical scavenging capacity of antioxidants from sesame cake extract was studied using DPPH radical on a kinetic model. Pure lignans and lignan glycosides isolated from methanolic extract by preparative HPLC were used in the study. To understand the kinetic behaviour better and to determine the radical scavenging activity of sesame antioxidants, the second-order rate constant (k_2) was calculated for the quenching reaction with DPPH radical. The k_2 values for sesamol, sesamol dimer, sesamin, sesamol, sesaminol triglucoside and sesaminol diglucoside were 4.00×10^{-5} , 0.50×10^{-5} , 0.36×10^{-5} , 0.13×10^{-5} , 0.33×10^{-5} and $0.08 \times 10^{-5} \text{ uM}^{-1}\text{s}^{-1}$, respectively (Suja et al., 2004).

Antioxidant activities of *Sesamum indicum* extracts derived from sesame seed by supercritical carbon dioxide extraction and by n-Hexane were determined by HU et al.(2004) using DPPH radical scavenging and linoleic acid system methods. The extracts at 30MPa presented the highest antioxidant activities assessed in DPPH method.

The antioxidant activities of activities of brown pigment, extract of n-Hexane and extract of supercritical dioxide extraction of black sesame seeds were investigated by Xu et

al. (2005).The results indicated that the brown pigment of sesame seed possessed excellent antioxidant activity.

PHARMACOLOGICAL ACTIVITIES AND CLINICAL TRIALS

Abortifacient effect

Ethanol (50 and 100%) extracts of the dried seed,administered intragastrically to pregnant rats at a dose of 200 mg/kg,was inactive. Acetone extract of the dried seed,on agar plate at a concentration of 0.2 g/plate,was active on Salmonella typhi TA98 and TA100 vs aflatoxin B1-induced mutagenesis and Aspergillus versicolor extract-induced mutagenesis.

Antibacterial activity¹²

Ethanol extract of the shade-dried seed ,on agar plate at a concentration of 2.5mg/ in e.coli, Proteus mirabilis, Pseudomonas aeruginosa, Staphylococcus aureus and Staphylococcus epidermidis. Seed oil, on agar plate at an undiluted dose, was inactive on Bacillus subtilis, Escherichia coli, Salmonella typhimurium, Staphylococcus aureus and Vibrio cholera. The seeds, on agar plate, were active on Bacillus subtilis, Escherichia coli, Pseudomonas aeruginosa and Salmonella typhimurium. Pretreatment of mice with sesame extract significantly reduced the lethality of bacterial infection, possibly because of its host-mediated action. No apparent acute toxicity was detected in mice by oral administration of 10 g/kg of the extract.

Antihypertensive effect¹⁰

Sesame oil lignin sesamin ,in two kidney, one clip(2K,1c) renal hypertensive rats fed a sesamin containing (1% w/w) diet, was investigated. The hypertension was markedly reduced, but the sesame diet ameliorated the vascular hypertrophy. Results indicated that sesamin is useful as prophylactic treatment to combat the development of renal hypertension and cardiac hypertrophy.

Anti-implantation effect¹¹

Ethanol extract of the seed, administered intra-gastrically to female rats at a dose of 200mg/kg, was inactive vs early pregnancy.

Anti-stress and Anti-oxidant combined activity ¹⁰

This study is aimed at assessing the scientific evidence on the effect of the intake of sesame seeds and derivatives on oxidative stress of individuals with systemic hypertension, dyslipidemia, and type 2 diabetes mellitus. A systematic review was conducted in seven databases (Lilacs, PubMed, ISI Web of Knowledge, Cochrane Library, Scopus, Trip Database, and Scielo) from September 2013 to January 2014. Clinical trials on the intake of sesame seeds and derivatives assessing the outcomes related to oxidative stress were retrieved. The risk of bias in the results of the studies selected was assessed according to the criteria of the *Cochrane Handbook for Systematic Reviews of Interventions*. This review included seven clinical trials showing that the intake of sesame resulted in the increase in enzymatic and non enzymatic antioxidants, as well as in a reduction in oxidative stress markers. This was mainly observed with the use of sesame oil for hypertensive individuals during 2 months and black sesame meal capsules for pre hypertensive individuals during four weeks. Most studies involved a small number of participants, sample size being considered a limiting factor for this review. In addition, a significant heterogeneity was observed in the type of population studied and the type of sesame and derivatives used, as well as their amount. The follow-up time was considered a limiting factor, because it varied in the different studies. The high risk of randomization and blinding biases found in the studies assessed determines lower scientific evidence of the results. Despite the limitations and biases identified in this systematic review, sesame showed relevant effects on oxidative stress, suggesting it could increase the antioxidant capacity.

Efficacy of vitamin C and ethanolic extract of *Sesamum indicum* in promoting fertility ¹¹

This study investigates the efficacy of ethanolic extract of *Sesamum indicum* (EES), vitamin C (VC), and EES + VC in promoting fertility and finding a possible link between their pro fertility effects and their antioxidant activities.

The results obtained showed that EES, VC, and more importantly EES + VC are capable of significantly increasing BW gain, seminal parameters, testosterone level, and body antioxidant activities.

Hyperglycaemic activity

Extract of the dried entire plant, administered to rats at a dose of 30% of diet, was active. Seedoil, administered orally to adults at a dose of 60 g/person, produced weak activity. Hot water extract (4%) or methanol eluent fraction (0.7%) of the defatted seed, administered orally to genetically diabetic 5 weeks old male KK-Ay-mice, had a reductive effect is suggested to be caused by the delayed glucose absorption.

Spasmogenic activity

Methanol (70%) extract of the seed, administered to guinea pigs at a dose of 1 mg/ml, was active on the uterus by atropine. Methanol (70%) extract of the seed, administered to rats at a dose of 1 mg/ml was active on uterus (estrogen).

Toxicity assessment

Ethanol (50%) extract, administered intraperitoneally to mice, produced LD 500 mg/kg. (Ref ; Medicinal plants of the world, vol -3, Ivan A. Ross – 2007, pg - 488)

Drug preparations containing sesame seeds

1. *Pirandaivadagam* - Ref: Siddhavaithiyathiratu (2006, pg-228)
2. *Thilatha vallathi*. - Ref : Agathiyar vaithya vallathi -600 (April 2001, Pg -14)

CONCLUSION

Though *Sesamum indicum* has various medicinal effects, it is widely known only for its food value and have very limited exposure over its medicinal values. When we are left open in the modern world and its evolving new diseases, the results derived from the analysis and research on sesame, leaves us with great hope. With its antioxidant, antihypertensive, antihyperglycaemic and other crucial properties discovered so far, it implies the need for more studies and researches in near future. One day we may get solutions to most of the deadliest cardiac issues, cancer and many more.

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