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Review Article

EAT TIL AND PROTECT DIL

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ABSTRACT

Sesame seeds have been grown in tropical regions throughout the world since pre-historic times. Sesame seeds look like tiny and simple pieces of nature. Sesame seeds seem to have originated in the Indian subcontinent. These nutty flavored and crunchy seeds of sesame have become a prominent cooking ingredient in different parts of the world. Sesamin and Sesamolin are two unique phytoconstituents present in these seeds, which help in correcting hypertension and hyperlipidemia. They serve as a good source of manganese, calcium, copper and vitamin B. Ayurveda recommends seed oil for body massage. The Sesame oil shows mildly laxative, emollient, hypolipidemic, anticancer, and hepato-protective actions. Sesame oil is incredibly popular for its nutritional antioxidant and medicinal properties.

Keywords: Til, Hypolipidemic, Sesame, Hepato-protective

INTRODUCTION

Sesame seed oil, which is low in saturated fat is an ideal cooking medium for a heart patient. Sesame (Sesamum indicum) is a flowering plant that is cultivated throughout the world for its edible seeds. Sesame seeds appear like tiny and simple pieces of nature's creation. Sesame seeds seem to have originated in the Indian subcontinent. They were one of the most primitive sources of oil known to human beings. Thereafter, these nutty flavored and slightly crunchy seeds of Sesame have become incredibly popular throughout the world for its nutritional and medicinal properties. Dry, roasted sesame seeds and vegetable oil are ground to form a thin light brown paste known as **tahini.** Tahini is one of the main components in famous middle-eastern dip, 'hummus'. Sesame seeds are also widely used for the manufacture of **margarine** in Europe. Sesame seeds also form a valuable source of dietary proteins, which are necessary for children growth. The plant is indigenous to India, and is cultivated in West indies, China, Japan, Africa, India and United states. It is nutritive, demulcent and possesses emollient properties. It is used in the preparation of liniments, plasters, ointments, and soaps. Traditionally, sesame is used in the treatment of hemorrhoids, dysentery, constipation, cough, amenorrhea, dysmenorrhea and ulcers. Sesame seeds have been used as a medicine since antiquity. They are considered to possess anti-oxidant, anti-cancer, lactogogue, diuretic, hepato-protective 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 its phytosterols content. It is also believed that til can help in prevention of certain forms of cancers.

Table-1

Scientific Classification			
Kingdom	: Plantae	Division: Tracheophyta	
Class	: Magnoliopsida	Order	: Lamiales
Family	: Pedaliaceae	Genus	: *Sesamum*
Species	: *S. indicum*		
Bionomial name: *Sesamum indicum*			

Table-2

Indian Synonyms
Bengali: Til
Hindi: Gingli, Safed til
Kannada: Yallu
Marathi: Til
Punjabi: Til
Sanskrit: Tila
Tamil: Cirrel, Ellu, Tilam
Telugu: Tillu
Urdu: Til

Table-3

International Synonyms
Arabic: Sim sim
Burmese: Hnan zi
Chinese: Huma
Danish: Sesamfro
English: Sesame
Nigerian: Benne seeds
Indian : Til, Gingly
Finnish: Sesami
German: Sesam
Italian: Sesamo
Japanese: Goma
Korean: Cham kkae
Persia: Konjed
Potuguese: Gergelim
Russia: Sezam
Spanish: Ajonjoli
Swedish: Sesam
Thai: Nga, Nga dam
Turkish: Susam
Vietnamese: Me Vung

History

In Hindu legends and beliefs, sesame seeds represent a symbol of immortality and the God Maha Vishnu's consort Maha Sri Devi herself represents the properties of the sesame seed. Therefore, Til oil is considered to be the most auspicious oil next to ghee used in Hindu rituals and prayers. Charred remains of sesame recovered from archeological excavations have been dated to 3500-3050 BC. Some reports claim sesame was cultivated in Egypt during the Ptolemiac period, while others suggest the New Kingdom. Records from Babylon and Assyria, dating about 4000 years ago mention sesame. Egyptians called it sesemt, and it is included in the list of medicines in the scrolls of the Ebers Papyrus dated to be over 3600 years old. Archeological reports from

Turkey indicate that sesame was grown and pressed to extract oil at least 2750 years ago during the empire of Urartu.

Geographical Distribution

Sesame seed is considered to be the oldest oilseed crop known to humanity. Sesame has many species, and most are wild. Most wild species of the genus *Sesamum* are native to sub-Saharan Africa. *Sesame indicum* originated in India. The herb is cultivated extensively in many regions of the world, including the People's Republic of China, India, Ethiopia, El Salvador, Nicaragua, Sudan, Mexico, Guatemala, and the United States. Numerous wild relatives occur in Africa and a smaller number in India. It is widely naturalized in tropical regions around the world and is cultivated for its edible seeds.

Climate and Soil

Sesame has ability to grow in areas, where other crops fail to survive. Sesame has been called a survivor crop. Sesame is very drought-tolerant, in part due to its extensive root system. However, it requires adequate moisture for germination and early growth. While the crop survives drought as well as presence of excess water, the yields are significantly reduced in either conditions. Most commercial cultivars of sesame are intolerant of water-logging. Sesame varieties have adapted to many soil types. The high yielding crops thrive best on well-drained, fertile soils of medium texture and neutral pH. However, these have low tolerance for soils with high salt and water-logged conditions. Commercial sesame crops require 90 to 120 frost free days. Warm conditions above 23 $^{\circ}$C favor growth and yields.

Botanical Description

Habitat: It is an annual plant with branching stem, growing 50 to 100 cm tall, with opposite leaves 4 to 14 cm long with an entire margin;

Flowers: The flowers are yellow, tubular, 3 to 5 cm long, with a four-lobed mouth. The flowers vary in color with some being white, blue or purple. Initiation of flowering is sensitive to photoperiod and to sesame variety. The photoperiod also impacts the oil content in sesame seed; increased photoperiod increases oil content. The oil content of the seed is inversely proportional to its protein content.

Fruits: Sesame fruit is a capsule, normally pubescent, rectangular in section and typically grooved with a short triangular beak. The fruit naturally split opens to release the seeds by splitting along the septa from top to bottom or by means of two apical pores, depending on the varietal cultivar.

Seeds: Sesame seeds are small. The size, form and colours vary among thousands of varieties now known. Typically, the seeds are about 3 to 4 millimeters long, 2 millimeters wide and 1 millimeter thick. The seeds are ovate, slightly flattened and somewhat thinner at the eye of the seed than at the opposite end. The weight of the seeds is between 20 and 40 milligrams. The seed coat may be smooth or ribbed.

Sesame seeds come in many colors depending on the cultivar harvested. The most traded variety of sesame is off-white coloured. Other common colours are buff, tan, gold, brown, reddish, gray and black.

Phytoconstituents

Seeds of Sesame have very high levels (up to 2.5%) of furofuran lignans with beneficial physiological activities, such as mainly sesamin, sesamolin, and sesaminol glucosides. During refinement sesamol and sesaminol, two phenolic antioxidants, are formed from sesamin and sesamolin. These antioxidants contribute in preventing high blood pressure, lowering cholesterol level and increase in supplies of vitamin E. Sesame seeds contain phytosterols associated with reduced levels of blood cholesterol. Sesame oil is mostly composed of triglycerides of the singly unsaturated oleic acid (40%) and the doubly unsaturated linoleic acid (45%). Due to its powerful antioxidant property and absence of triply unsaturated fatty acids, sesame oil has an excellent shelf life. A new anthraquinone derivative, named anthrasesamone F, was isolated from the seeds of *Sesamum indicum.* Its structure was determined to be (Z)-6, 7-dihydroxyl2-(6-hydroxy-4-methyl-3-pentenyl) anthraquinone[1]. Roots of sesame indicum were reported to possess, hydroxysesamone and 2, 3-epoxysesamone and a chlorinated red napthaquinone pigment, named chlorosesamone having antifungal activity[2]. Three anthraquinones isolated from roots were, anthrasesamone A, B and C. Two more anthraquinone derivatives isolated from the roots of *Sesamum* indicum were, named anthrax sesamone D and E[3]. 2-Geranyl-1, 4-naphthoquinone was isolated from the hairy root culture of *Sesamum indicum*[4]. By using mass and NMR spectroscopy, a new lignin was isolated from defatted sesame seeed flour as, sesamolinol diglucoside. Two phenylethanoid glycosides and three triglycosides having same sugar sequence were isolated from whole plant water extract. Sesame seeds are a good source of calcium and are therefore suitable for sufferers of osteoporosis. Sesame seeds contain a high amount of the antioxidant phytic acid. Sesame seeds contain the lignans pinoresinol and lariciresinol[5]. Sesame oil contains vitamin E in abundance along with vitamin B complex and vitamin A, which helps nourish and rejuvenate skin. Seeds also have a good amount of manganese, calcium, iron, phosphorous, zinc, vitamin B_1, trypthophan and dietary fibres. (Table-4)



Figure 1. Sesame plant



Figure 2. Sesame Flower



Figure 3. Sesame fruit



Figure 4. Sesame seeds

Table 4: Nutritional Data

Nutrient	Amount
Copper	1.48 mg
Manganese	0.88 mg
Tryptophan	0.12 g
Calcium	351.00 mg
Magnesium	126.0 mg
Iron	5.24 mg
Phosphorous	226.44 mg
Zinc	2.80 mg
Thiamine	0.28 mg
Dietary Fiber	4.24 g
With reference to sesame seeds 36.00 g, 206.28 calories	

Preparations of *Sesamum indicum*



Figure 5. Til cookies



Figure 6. Til ladoo



Figure 7. Til vadi



Figure 8. Til pitha

Pharmacological Activities

Analgesic, Anti-pyretic and Anti-inflammatory activity

Nahar and Rokonuzzaman reported the analgesic activity of ethanolic extract of *Sesamum indicum*, when tested using acetic acid induced writhing model in mice. The extract at 500mg/kg showed significant inhibition in writhing, which was comparable to marketed preparation Ibuprofen 50mg/kg[6]. Antipyretic activity of sesame oil was determined by yeast induced pyrexia in rats. Sesame oil produced significant antipyretic effect comparable to paracetamol. Sesame oil elicited significant antinociceptive activity centrally as well as peripherally, when studied using, acetic acid induced writhing test, formalin induced paw licking and radiant heat induced pain. Sesame oil significantly inhibited the carrageenan induced rat paw edema producing anti-inflammatory activity comparable to diclofenac sodium.[7] In several studies, it has been found that sesamin inhibits Δ5 desaturase activity, resulting in accumulation of dihomo-linolenic acid, which displaces arachidonoic acid and consequently decreases the formation of pro-inflammatory compounds[8]. Therefore, sesame oil may have therapeutic potential in relieving pain and inflammatory diseases due to the presence of active principle sesamin lignans.

Hypo-lipidemic activity

Animal studies revealed that sesame lignans reduce cholesterol levels, both by inhibiting absorption and by decreasing 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 liver[9] . Some findings indicate ligand property of sesamin for SREBPs and PPARs[10].

Anti-neoplastic activity

Sesame flower extract possessed tumor arresting property. Significant inhibition of tumor growth was observed on til consumption in mice[11]. Smith and Salerno showed that sesame oil caused in vitro inhibition of the growth of malignant melanoma and the proliferation of human colon cancer cells.

Wound healing activity

Sesamum indicum seeds and oil both promote wound healing in experimentally induced wounds in 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 [12].

Hepato-protective activity

Ethanolic extract of Sesamum indicum seeds at 400mg/kg and 700mg/kg, when administered orally, produced a significant hepato-protective effect. Sesame normalized the elevated levels of Serum glutamate oxaloacetate transaminase, serum glutamate pyruvate transaminase, alkaline phosphatase, acid phosphatase, total protein, albumin, and total bilirubin[13].

Cognitive deficits protective effect

Sesaminol glycosides, one of the most abundant lignan glycosides present in sesame seed showed protective effect against cognitive deficits induced by beta amyloid peptide in mice[14].

Antioxidant activity

The antioxidant and free radical scavenging activities of sesamol have been reported using a nanosecond pulse radiolysis technique[15].

Sesame oil exhibited 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[16]. Furthermore, til elevated the glutathione peroxidase, superoxide dismutase, and catalase activity in rodents under various conditions of oxidative stress[17]. Clinically, it was found that sesame oil consumption helped in enhancing human anti-oxidant defense system. A study in hypertensive patients remarkably reduced oxidative stress and simultaneously increased GPx, SOD, and catalse activities on sesame consumption[18]. Recently in vitro studies have been done for comparing antioxidant profile of black

and white til. It was concluded that ethanolic extract of white seeds possessed better antioxidant profile [19].

Anti-bacterial activity

85% reduction in bacteria causing gingivitis was seen in an experiment, where patients rinsed their mouth with sesame oil. Sesame oil was also helpful in curing chronic sinusitis. As a throat gargle, sesame oil was able to kill streptococcus and other common cold bacteria.

Anti-fungal activity

Chlorosesamone, hydroxysesamone and 2, 3-epoxysesamone elicited antifungal activity against Cladosporium flavum[20].

Effect on plasma tocopherol levels

Evidence from animal studies suggests that the dietary source of γ-tocopherol can significantly affect plasma levels of tocopherol as well as its functional vitamin E activity. Consumption of moderate amounts of sesame seeds appears to significantly increase plasma γ-tocopherol and alter favorably plasma tocopherol ratios in humans Enhanced plasma gamma- tocopherol concentration and vitamin E activity are believed to be responsible for its cardio-protective and anticancer activity.

Safety Profile

By and large, no adverse effects have been reported upon regular consumption of Til by humans. However, Sesame seed allergy is a kind of hypersensitivity reaction observed in a few sensitive individuals. Generally, the reaction includes hives, dermatitis and itching. Rarely, disease manifestation may take a severe turn, evoking serious physical symptoms like abdominal pain, vomiting, swelling of lips and throat leading to difficulty in breathing and chest congestion.

Table 5: Strange Facts

Sesame is known in Africa as "benne" equivalent of good luck.
Sesame oil contains high amounts of Vitamin E, an anti-oxidant that lowers cholesterol.
It is a key ingredient in a variety of world cuisines, especially Asian, Middle Eastern and Mediterranean.
Omega-6 fatty acids, flavonoids, phenolic anti-oxidants, and vitamins present in Til possess potent anti-cancer property.
Sesame seeds are especially rich in oleic acid, which helps to lower bad cholesterol (LDL) and increase good cholesterol (HDL) in blood.
Sesame seeds are a good source of B-complex vitamins such as niacin, folic acid, thiamine, pyridoxine and riboflavin.
Calcium, iron, manganese, zinc, magnesium, selenium and copper concentrated in sesame seeds play a vital role in bone mineralization, RBC production, enzyme synthesis, hormone production as well as regulation of cardiac and skeletal muscle activities.
Niacin abundantly found in sesame, helps in reducing LDL in blood and enhances GABA activity inside the brain, which in turn helps in reducing anxiety and neurosis.
Sesame seeds are largely used in the manufacture of margarine in Europe.
Dry fried Til is sprinkled over toasts, biscuits, cakes, salads etc. to enhance nutritional value.
Sesame seeds are used in many traditional south Indian sweet delicacies.

CONCLUSION

Sesame seed oil, which is low in saturated fat and high in polyunsaturated and monounsaturated fats, is an ideal cooking medium for a heart patient. The antioxidants in sesame seed oil, viz., sesaminol, sesamolin and sesamolinol protect fats from being oxidized. Sesaminol maintains the so called bad cholesterol (LDL) in an unutilized state, which prevents arteriosclerosis. Sesamin also helps maintain normal blood pressure. It helps regulate the body's immune and auto immune system balance. It inhibits a set of regulating compounds, which cause inflammation, clotting and other immune imbalances that contribute to disorders such as heart disease and autoimmune joint disorders.

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