

SESAME SEED OIL & ITS PROPERTIES.

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ABSTRACT

*The major issue of the current era is an unbalanced and poor diet like unhealthy fast foods, the main cause of various diseases. Most nutraceutical and pharma industries formulating the medicines from sources are expensive and have several side effects. However, scientists are making efforts to find out the natural sources of medicines for the betterment of human health and treatment of diseases. Simultaneously, the worldwide preferences have shifted from artificial to natural resources and unconventional crops (i.e., oilseeds as protein source) and foods are becoming part of regular diet in most of the community, nutraceutical, and pharma industries. Sesame (*Sesamum indicum*L.) is one of the unconventional crops providing multiple benefits due to its special bioactive components, such as sesamin, sesaminol, and gamma-tocopherol, and fatty acids composition like unsaturated fatty acids (i.e., oleic acid, linoleic acid, stearidonic acid, palmitoleic acid, and traces of linolenic acid). Sesame seed oil supplementation not only improves the quality of snack frying oils but also plays a key role in the formation of good quality healthy snack foods. Moreover, its seeds and oil play imperative role in the formulation of medicines utilized for different ailments. The current review highlights the importance and utilization of sesame seed and oil in pharmaceuticals, nutraceuticals, and food (especially snacks) industries.*

Keywords: Antioxidant; neuroprotective; anaphylaxis.

1. INTRODUCTION:

Sesame (*Sesamum indicum* L.) belongs to the family Pedaliaceae is considered one of the most ancient Oilseed crops known to mankind, it is also known as Benne seed in Africa and sim-sim in East Africa.

Sesame grows well in subtropical and tropical regions and commonly planted in Africa and Asia. Sesame is an annual plant that can grow 20 inches to 60 inches tall depending on the variety and the agronomic Conditions. The plant is very drought-tolerant because of its Extensive root system and does not require irrigation. Sesame seeds, which are about 3 mm to 4 mm long, 2 Mm wide and 1 mm thick are enclosed in pods also referred To as capsules. Seeds can be white, buff, tan, gold, brown, Reddish, gray or black. Early varieties had been grown on Small plots and were harvested by hand because of shattering Characteristic of the pods. Some claim the famous expression “open sesame” in the story of Ali Baba and the Forty Thieves, One of the tales from the Arabian Nights, was adopted because Sesame capsules burst open even with the slightest touch At maturity and make a popping sound while opening. Even The name of the popular TV program for children “Sesame Street” is said to be derived from the phrase “open sesame” To generate curiosity.

The Ayurvedic has been used sesame oil in their Medical system. Sesame seeds have antioxidant and antitumor potential. Due to the abundant amount of Protein the oil cake is used for livestock feed. Sesame oil has natural Antioxidants such as sesamin, sesamol, and Sesamol known as the most stable vegetable oils having a long shelf life. Sesame seed oil is rich in Omega 6 fatty acids but lacks Omega 3 fatty acids. So there is a need to produce more Omega 3 fatty Acids like alpha-linolenic acids with the help of Various desaturase enzyme pathways for Improvement of the quality of sesame oil as healthy Oil. In addition to other Uses of the oil, like cooking as well as for medicinal Purposes such as the treatment of ulcers and burns, the oil extract is used in making soap and skin Moisturizers.

The use of sesame oil In the cosmeceutical and The use of sesame oil In the cosmeceutical and Pharmaceutical industries is based on its content in Several phytochemical agents that improve the Quality and health of the skin.

Due to increase in production level of sesame seeds during last few years, its importance to the consumers and its application in numerous valuable, healthy, and nutritious products have increased. Nutritionally, it is considered an important protein source owing to appreciable amounts of essential as well as nonessential amino acids as compared to other seed proteins. Additionally, it has plenty of nutrients essential for the maintenance of optimum health.

In the addition of this, sesame has three times more calcium compared with an equivalent quantity of milk. Moreover, the defatted sesame cake after oil extraction is an excellent source of quality protein and numerous useful phytochemicals (bioactive nutrient plant chemicals that may provide desirable health benefits in addition to basic nutrition in order to reduce the risk of major diseases). Hence, sesame is considered an unconventional protein source owing to the fact that it is primarily utilized for oil extraction. Sesame seeds and its components have the tendency to provide various health benefits to an individual including the nutraceutical as well as pharmaceutical benefits. Sesame seeds have been proven to exhibit anticancer, antioxidant, and cholesterol lowering properties.



Fig 1: Plant of sesame seed.

2. COMPOSITIONAL PROPERTIES:

Sesame seed is unique in its composition having appreciable amounts of crude protein, moisture, crude fat, carbohydrates, crude fiber, and mineral fractions. It indicates the nutritional composition of whole as well as defatted sesame seeds. It can be observed that the defatted sesame seeds contain higher levels of moisture (7.34%), protein (40.90%), crude fiber (7.82%), ash (7.49%), and NFE (32.48%), while crude fat (41.20%) was higher in whole sesame seeds.

Raw sesame seeds contain many phytochemicals such as terpenoids, saponins, alkaloids, steroids, tannins, and flavonoids. It also contains other compounds such as sesamin, sesamol, sesamol, and gamma-tocopherol, and some phenolic acids such as flavonol glycosides like 3-coumaroyl-quinic acid, protocatechuic acid, quinic acid, hydroxybenzoic acid, ellagic acid pentoside, quercetin 3,4-diglucoside, and quinic acid. Furthermore, cephalin, lecithin, and free phenolic compounds are also present in sesame seeds.

3. FUNCTIONAL PROPERTIES:

Black sesame seeds are mainly used for oil extraction. The full-fat sesame seed (*Sesamum indicum* L.) exhibits excellent functional properties like foam capacity and stability, oil and water absorption, bulk density, nitrogen solubility, and emulsion capacity and stability. The defatting process results in an increased amount of carbohydrates, crude protein, crude fiber, ash, and mineral contents.] Moreover, the defatted flour has relatively

good foaming properties, water absorption, and emulsification, and, however, reduced oil absorption ability and bulk density owing to high amount of proteins. The nitrogen solubility index depends on the pH, ranging from 4 to 8. Furthermore, the sesame protein isolates exhibited excellent functional attributes including water and oil absorption capacities, and foaming and emulsion properties. So, the functional properties of sesame seed favored their utilization in making diverse foods. Sesamol and sesamin are major phenolic compounds found only in sesame plants.

4. IMPORTANT ANTIOXIDANTS IN SESAME SEED OIL:

4.1. Lignans:

The Lignans are a large group of low molecular weight polyphenols found in plants, particularly seeds, whole grains, and vegetables. The name derives from the Latin word for “wood”. Lignans are precursors to phytoestrogens Sesamin and sesamol, the major lignans present in sesame oil, are known for their antioxidative properties. Roasted sesame oil has a higher concentration of sesamol, the thermally degraded product of sesamol, which is considered a more potent antioxidant compared to its parent molecule.

Lignan is a constituent of lignin, a generic name for a compound resulting from two p-hydroxyl phenyl propane molecules. It constitutes a group of important plant phenolics characterized by the coupling of two phenylpropanoid (C6-C3) units by a bond between β -positions in the propane side chains. Two major groups of lignans exist in sesame seeds, namely oil soluble lignans and glycosylated water soluble lignans. Sesamin, sesamol, sesaminol, sesamolol and pinoresinol are the main oil soluble lignans in sesame. The major glycosylated lignans are sesaminol triglucoside, pinoresinol triglucoside, sesaminol monoglucoside, pinoresinol monoglucoside and two isomers of pinoresinol diglucoside and sesaminol diglucoside.

4.2. Tocopherols:

Tocochromanols are amphipathic molecules where the lipophilic isoprenoid side chain is associated to the membrane lipids and the polar chromanol ring is exposed to the membrane surface. The structural features of tocopherols govern their metabolic fate and biological activities. All isoforms possess lipid antioxidant activity and α -tocopherol possesses the highest vitamin E activity in mammals. Tocopherols are a class of plant phenolics that have important antioxidant and nutritional properties. Being natural antioxidants, they inhibit oil oxidation. They act as biological kidnappers of free radicals and could prevent diseases, besides possessing an important nutritional value. Sesame seed oil has significant potential against diazinon-induced stress due to its free radical scavenging, antioxidative, and anti-inflammatory properties. Dietary components of sesame seed oil also have improving outcomes in blood pressure reduction and work significantly in the variation of the electrolytes, increasing antioxidants, and decreasing the lipid peroxidation. Likewise, several scientists have reported the presence of antioxidant and free radical lowering activities of sesamol by using the radiolysis technique of nanosecond pulsefunction for human beings as a source of Phytosterols.

4.3. Phytosterols:

Plants possess the bioactive compounds that have a chemical structure very similar to cholesterol and when present in sufficient amounts in the diet reduce cholesterol level in the blood, thereby enhancing the immune response and decrease risk of certain cancers. They are tri-terpenes with a wide spectrum of biological activities in animals and humans, including anti-inflammatory, anti-bacterial, antioxidative and anti-cancerous. Different groups of phytosterols include sitosterol, campesterol, stigmasterol.



Fig 2: Sesame Seeds.

5. HEALTH BENEFITS OF SESAME SEED:

Nutraceutical benefits numerous nutraceutical benefits of sesame and its bioactive components have been reported In the literature. Sesame seeds showed various noticeable Health benefits like reduction in high blood pressure, antioxidant activities, and anticancer property and showed Hypocholesterolemic effects these seeds Are widely used to treat respiratory tract infections, infant Cholera, diarrhea, and other intestinal and bladder diseases. Sesame powder is also used to control amenorrhea, dysmenorrhea, ulcers, and hemorrhagic acne.

Lignans of Sesame possess antioxidant properties and health-enhancing Activities lignans include sesamol, sesaminol, Sesamolol, and sesamin. Physiologically active ingredients have many health promoting attributes that is, Lower blood cholesterol and lipid levels; provide anti-in- Flammatory properties; and enhance hepatic fatty acid oxidase and neuroprotective effects on brain damage or Hypoxia. sesame seed oil has significant potential Against diazinon-induced stress due to its free radical Scavenging, antioxidative, and anti-inflammatory properties dietary components of sesame seed oil also have Improving outcomes in blood reduction and work Significantly in the variation of the electrolytes, increasing Antioxidants, and decreasing the lipid peroxidation Likewise, several scientists have reported the presence of Antioxidant and free radical lowering activities of sesamol by Using the radiolysis technique of nanosecond pulse.

6. METHOD OF EXTRACTION OF SESAME SEED OIL:

6.1. Sesame Seeds Cleaning: The purpose is to remove clay, sand, iron scrap, weed seed, immature sesame seeds, etc. Then rinse it to get rid of side by side mud, tiny impurities and dust.

6.2. Softening: By adjusting moisture and temperature, sesame seed is softened to have proper plasticity, which is easy to be flaked into thin pieces. After softening, sesame temperature is 47-50°C and moisture 7%.

6.3. Flaking: Use roller flaking machine to press particle sesame seeds into flakes. The purposes of flaking are: destroy cell tissue, make oil easily extruded from cells; when particle seeds are pressed into thin flakes, their superficial area is enlarged, so oil outlet area is increased, and the distance of oil that leaves flakes is greated shortened.

6.4. Steam Cooking: This process is to make raw flakes into cooked flakes by adding water, heating, drying, etc. Its functions are:

- (1) To cohere: after flaking, 68-79% of sesame seed cells are destroyed, but the oil is still dispersive oil drops and is unable to cohere. But if you add water first to dampen the sesame seeds before steam cooking, protein will absorb water and expand, so the cell wall is destroyed from inside, which completely destroy the seed cells.
- (2) To adjust the flakes structure: flake structure refers to its plasticity and elasticity. On one hand, flakes shall have enough elasticity to withstand pressure; on the other hand, they shall have certain plasticity so that they can combine into cakes after pressing. Adding water and increasing temperature can soften flakes and make them easy to take shape. But if the water content is too low, protein will have big degeneration, and the flakes will be hard and not easy to form cakes. So to adjust all technical parameters in steam cooking process can achieve hardness of flakes required by oil pressing
- (3) To improve oil quality: in the steam cooking process there are some physical, chemical and biological reactions

6.5. Sesame Oil Pressing: The working principle of screw oil press: screw oil press uses the rotating spiral shaft to continuously press the flakes from the inlet into the barrel. Every rotation of the screw shaft will push the materials forward. At the same time, with the gradual shortening of pitch or the gradual reduction of screw thread depth, the space volume in barrel is gradually condensed, and oil is pressed out. This kind of oil making process is automatic and continuous, and the oil constantly flows from the gaps in pressing cage; while the flakes after pressing form tile shape cakes and constantly discharged from the other end of the screw oil press. In total, the pressing of sesame seed oil is divided into 3 phases: pre-pressing phase, pressing phase and cakes forming phase.

6.6. Sesame Oil Filtering: After all the above steps, sesame oil is made but also may contain impurities. In this case, it shall be filtered to get pure sesame oil.

6.7. Sesame Oil Refining: It is designed to remove many useless and unnecessary substances included in the crude sesame oil.



Fig 3: Extracted Sesame Seed Oil.

7. USES OF SESAME SEED OIL:

- (1) Sesame oil is often used to saute meats and vegetables.
- (2) Sesame oil is used liberally on your skin for massage and for moisturizing purposes.
- (3) Sesame oil is an emollient, meaning it can help to soften your skin and
- (4) Inflammation Many cultures have used sesame oil in traditional medicine as an anti-inflammatory. Traditional Taiwanese medicine has used it to treat joint pain, toothaches, cuts, scrapes, premenstrual cramps etc.
- (5) Stress and Depression Relief Sesame oil has an amino acid called tyrosine. Tyrosine boosts serotonin, which can help fight feelings of stress and depression.
- (6) Sun Damage Prevention the antioxidants in sesame oil may protect skin against UV damage. Sesame oil resists up to 30% of UV rays, while other oils only resist up to 20%.

8. SESAME SEED MARKET:

The market for sesame oil is mainly located in Asia and the Middle East, where the use of domestically-produced sesame oil has been a tradition for centuries.[6] About 65% of the annual US sesame crop is processed into oil, and 35% is used in food

Cold pressed sesame oil is unbleached, unrefined and cold-pressed which has a fresh aroma of sesame. For cooking and dietary purpose, cold-pressed sesame oil is one of the healthiest cooking oil with numerous health benefits.

9. VARIETIES OF SESAME SEED OIL:

There are many variations in coloration: cold-pressed sesame oil is pale yellow, while Indian sesame oil (gingelly or til oil) is golden. East Asian sesame oils are commonly made with roasted/toasted sesame seeds, and are dark brown, with a different flavor.

Sesame oil is traded in any of the forms described above. Cold-pressed sesame oil is available in Western health shops. Unroasted (but not necessarily cold-pressed) sesame oil is commonly used for cooking in South India, the Middle East, halal markets, and East Asian countries. Toasted sesame oil is used for its flavor.

10. ALLERGY:

Sesame can trigger the same allergic reactions, including anaphylaxis, as seen with other food allergens. Cross-reactivity exists between sesame and peanuts, hazelnuts and almonds. In addition to food products derived from sesame seeds, such as tahini and sesame oil, persons with sesame allergies are encouraged to be aware of foods that may contain sesame, such as baked goods. In addition to food sources, individuals allergic to sesame have been warned that a variety of non-food sources may also trigger a reaction to sesame, including cosmetics and skin-care products.

REFERENCES

1. Boukid, "Oat proteins as emerging ingredients for food Formulation: where we stand?" *European Food Research and Technology*, vol. 247, no. 3, pp. 535–544, 2021
2. A. Saatchi, H. Kiani, and M. Labbafi, "Structural characteristics and functional properties of sesame protein concentrate-maltodextrin conjugates," *Journal of Food Measurement And Characterization*, vol. 15, no. 1, pp. 457–465, 2021.
3. P. K. Brar and M. D. Danyluk, "Nuts and grains: microbiology And preharvest contamination risks," *Preharvest Food Safety*, Vol. 6, pp. 105–121, 2018.
4. R. A. Sbaih, H. M. Al-Hourani, Y. Khader, N. Khawaja, D. Hyassat, and K. Ajlouni, "Dietary Patterns of University Students in Jordan: A Cross Sectional Study," 2020.
5. F. Hashempour-Baltork, M. Torbati, S. Azadmard-Damirchi, And G. P. Savage, "Quality properties of puffed corn snacks Incorporated with sesame seed powder," *Food Sciences and Nutrition*, vol. 6, no. 1, pp. 85–93, 2018.
6. B. Matthäus and M. M. Özcan, "Fatty acid composition and Tocopherol contents of some sesame seed oils," *Iranian Journal of Chemistry and Chemical Engineering*, vol. 37, no. 5, pp. 151–155, 2018.
7. Aditya V, Babitha G A, Prakash S, Timmasetty J. Evaluation of Antibacterial Efficacy of Sesame Seed on Periodontal Pathogens : An In Vitro Study. Published online 2019:3-6.
8. Deep A, Sharma M, Kumar V. 2019. Enlightening Food Application and Mega Health Benefits Of Sesamum indicum L. *Int J Cur Microbiol Appl Sci*.8(01):2224-2232. Doi:10.20546/ijcmas.2019.801.232
9. Zhou L, Lin X, Abbasi A M, Zheng B. Phytochemical Contents and Antioxidant and Ant proliferative Activities of Selected Black And White Sesame Seeds. 2016;2016.
10. Naser A, Jaradat N, Malkieh N, et al., Impact of Sesame Oil Source : A Quality Assessment For Cosmeceutical and Pharmaceutical Use. 2019;(2159):189-196.
11. Sakan G Y I, Indarjulianto S, Nururrozi A, Raharjo S. Sensitivity of *Microsporium canis* Isolated From Dogs. 2020;14(December):108-111
12. Arif T, Mandal T, Chandra B, Viswavidyalaya K, Dabur R. 9. Natural products : Anti-fungal Agents derived from plants. 2011;(January)
13. B. Matthäus and M. M. Özcan, "Fatty acid composition and tocopherol contents of some sesame seed oils," *Iranian Journal of Chemistry and Chemical Engineering*, vol. 37, no. 5, pp. 151–155, 2018.
14. E. E. Özdemir, A. Görgüç, E. Gençdağ, and F. M. Yılmaz, "Physicochemical, functional and emulsifying properties of plant protein powder from industrial sesame processing waste as affected by spray and freeze drying," *LWT*, vol. 154, Article ID 112646, 2021.
15. M. M. Aondona, J. K. Ikya, M. T. Ukeyima, T. w. J. A. Gborigo, R. E. Aluko, and A. T. Girgih, "In vitro antioxidant and antihypertensive properties of sesame seed enzymatic protein hydrolysate and ultrafiltration peptide fractions," *Journal of Food Biochemistry*, vol. 45, no. 1, Article ID 13587, 2021.

16. Sokola and J. Yonakolo, "Study of nutritional values of some traditional foods in Nigeria," *Medbiotech Journal*, vol. 2, no. 2, pp. 65–68, 2018.
17. O. B. Mohammed, A. El-Razek, A. Mohamed, M. H. Bekhet, and Y. G. E. D. Moharram, "Evaluation of Egyptian chia (*Salvia hispanica* L.) seeds, oil and mucilage as novel food ingredients," *EJFS*, vol. 47, no. 1, pp. 11–26, 2019.
18. M. Parikh, T. G. Maddaford, J. A. Austria, M. Aliani, T. Netticadan, and G. N. Pierce, "Dietary flaxseed as a strategy for improving human health," *Nutrients*, vol. 11, no. 5, p. 1171, 2019.
19. Edelman, M.; Colt, M. Nutrient Value of Leaf vs. Seed. *Front. Chem.* 2016, 4, 32.
20. Al-Jasass, F.M.; Al-Jasser, M.S. Chemical Composition and Fatty Acid Content of Some Spices and Herbs under Saudi Arabia Conditions. *Sci. World J.* 2012, 2012, 1–5.

