Sesame Seed Oil Properties

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Introduction

Sesame, *Sesamum indicum* L., formerly classified as *Sesamum orientale* L., also referred to as gingelly, til, benniseed or simsim, is an annual herb and belongs to Pedaliaceae family. Most of the wild species are native to sub-Saharan 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.

According to the historical documents, Thomas Jefferson grew sesame seed in test plots 200 years ago and referred to it as beni or benne, the name used in Africa. Although sesame was introduced to the U.S. in the 1930s, the production has been limited because of the lack of cultivars that could be harvested mechanically. The U.S. commercial sesame production began in the 1950s following the discovery of a non-shattering mutation in 1943 leading to development of varieties suitable for machine harvesting. Today, sesame is grown in Texas and Oklahoma. Baco, Paloma, UCR3, SW-16 and SW-17 are some of the non-shattering sesame varieties grown in U.S.

Utilization

Sesame seeds are commonly used to top breads, buns, bagels, crackers and cakes and are consumed after toasting or crushing. Ground sesame seeds are used in East African cuisine to make soups and fish dishes and as condiment in some Asian and Indian dishes. They also are a popular ingredient in sweets similar to peanut brittle. The Middle Eastern candy known as halva is made from sweetened sesame seeds. Tahini is a sesame paste made from hulled and lightly roasted seeds. There are reports indicating seeds are used in traditional Indian and Chinese medicine.

Sesame seeds may contain about 40% to 60% oil and 25% protein. Seed oil may be used for cooking. Because of its distinct and strong flavor, sesame seed oil is mostly used as a flavoring agent. There are reports indicating sesame seed oil also has been used as a topical antibacterial, antifungal and antiviral agents in traditional medicine. Salad dressings, shortening and some margarines are formulated with sesame seed oil. It is a common flavor ingredient in some East Asian dishes. Sesame oil also is used in non-food applications such as ingredient in soaps, paints, cosmetics, perfumes and insecticides.

Processing

Sesame seeds go through a series of processing steps to extract oil. The process is similar to that used for other oilseeds (see OSU Fact Sheets FAPC-158, Oil and Oilseed Processing I and FAPC-159, Oil and Oilseed Processing II). Two types of sesame oil are available in the market; a pale yellow and an amber-colored aromatic oil. The latter type, which is mechanically pressed from toasted seeds is not recommended for cooking. Instead, it is normally used as a flavoring agent in cold food applications or added in the final stages of cooking. Since, this amber colored oil does not go through the typical refining steps like the other cooking oils, it has a very intense flavor, low smoke point and burns easily. Pale yellow oil is produced for cooking applications and goes through several refining steps (see Fact Sheet FAPC-160 Oil and Oilseed processing III: Crude Oil Refining and Preparation for Biodiesel Production) to remove color, aroma and other components not desirable in many food formulations. Sesame meal left after the oil is pressed from the seed, is high in proteins (34% to 50%) and used as feed for poultry and livestock.

Oil Properties

Sesame seed oil is a highly unsaturated oil. Linoleic acid which is a polyunsaturated fatty acid (see Fact Sheet FAPC-196, Lipid Glossary) is the main oil component comprising about 40% to 50% of the all fatty acids present in the oil (see Table 1). Linoleic acid is an essential fatty acid meaning that human body cannot synthesize it, hence, it needs to be provided in the diet to maintain good health. Oleic acid, which is

Table 1. Fatty acid composition of sesame seed oil.

Fatty acid name	*Content (%)*
Myristic (14:0)	0.0 - 0.1
Palmitic (16:0)	7.0 - 10
Palmitoleic (16:1)	0.1 - 0.2
Stearic (18:0)	4 - 6
Oleic (18:1)	33 - 44
Linoleic (18:2)	40 - 50
Linolenic (18:3)	0.3 - 0.5
Arachidic (20:0)	0.3 - 0.5
Behenic (22:0)	0.0 - 0.3
Lignoceric (24:0)	0.0 - 0.3

a monounsaturated fatty acid more stable than linoleic acid, is the second-most abundant fatty acid in sesame seed oil.

Although sesame seed oil is rich in polyunsaturated fatty acids, it is considered to be resistant to oxidation and rancidity due to presence of the compounds possessing antioxidant properties in the oil. Tocopherols and tocotrienols are two groups of fat soluble compounds with antioxidant properties. Total tocopherol content of the sesame oil varies between 530 mg per kg and 1,000 mg per kg. Gamma tocopherol is the major tocopherol, 521 mg to 990 mg per kg, followed by delta (4 mg to 20 mg per kg) and alpha tocopherol (up to 3 mg per kg). Sesame oil may contain up to 20 mg per kg of gamma tocotrienol. Sesame lignans have attracted interest because of their health-promoting properties such as lowering blood glucose and cholesterol levels, providing prevention against cardiovascular diseases and cancer, and alleviating postmenopausal syndrome. Sesamin, sesaminol and sesamolin are the main lignans in sesame oil. Decomposition of sesamolin during the processing of sesame oil leads to formation of a phenolic compound called sesamol. Long shelf life of the sesame oil is attributed to sesamol. There are reports suggesting sesamol may act as a metabolic regulator and possesses antioxidant and anti-aging properties. Although lignans are present in very small quantities in sesame oil (parts per million level), they exhibit significant biological activity even at very low concentrations.

A group of compounds known as phytosterols also are biologically active minor components naturally present in sesame oil. Many scientific studies link these minor oil components to health benefits including antioxidation, antiatherosclerosis, anticancer, plasma cholesterol lowering and free radical inhibition effects. Phytosterol content of the sesame oil is higher than the common vegetable oils. β-Sitosterol (58% to 62% of total phytosterols), campesterol (10% to 20%) and stigmasterol (3% to 6%) are the major phytosterols found in sesame seed oil. Total phytosterol content of the oil may vary between 4,500 mg and 18,960 mg per kg. It is well established that daily consumption of phytosterol in diet may lower blood cholesterol level and provide protection against hyperlipidemia and cardiovascular diseases. Specifically, β-sitosterol is reported to inhibit prostate and breast cancer tumor growth and proliferation.

Conclusion

Sesame seed oil can be a healthy component of a human diet provided the product is handled properly and used in applications for which it is produced. It is important to note that amber colored sesame seed oil should not be used in high temperature applications, like cooking and frying. It is good for applications such as salad dressings and flavoring foods after cooking.

On April 23, 2021, the Food Allergy Safety, Treatment, Education and Research (FASTER) Act was signed into law, declaring sesame as the ninth major food allergen recognized by the U.S. This change will become effective on January 1, 2023, so labeling of sesame as an allergen will not be required until that time.

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