



UNLOCKING THE SECRETS OF SESAME FLORAL BIOLOGY

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INTRODUCTION

Sesame (*Sesamum indicum*), commonly known as benne or gingelly, stands as a venerable crop with a captivating history and multifaceted utility. As one of the oldest oilseed crops known to humanity, its origins trace back to the Indian subcontinent, where the cultivated variety, *Sesamum indicum*, first took root. Archeological discoveries, including charred sesame seeds dating back to 3500-3050 BCE, indicate its domestication over 5500 years ago. Moreover, historical records hint at early trade routes between Mesopotamia and the Indian subcontinent, establishing sesame as a coveted commodity as early as 2000 BC.

Revered for its versatility, sesame finds itself widely naturalized across tropical regions worldwide, cultivated primarily for its oil-rich seeds. With its distinct nutty flavor, sesame oil has permeated cuisines globally, while in India, sesame seeds hold a prominent place, known locally as "Til" or "Gingelly," utilized as both a flavoring agent and a nutritional powerhouse in various culinary delights.

BOTANICAL DESCRIPTION LIKE SESAME (*Sesamum indicum* L.)

Habitat:

Sesame is widely cultivated in tropical, subtropical, and southern temperate regions worldwide, thriving in warm climates. Africa and India host numerous wild relatives of

sesame, contributing to its genetic diversity and adaptability.

Habit:

Sesame is an erect annual plant belonging to the family Pedaliaceae. It grows to a height of 5 to 6 feet (approximately 155 to 185 cm). The plant produces bell-shaped inflorescences that are 1 to 2 inches (about 2.5 to 5 cm) long. These inflorescences emerge from the leaf axils, where the leaf stalk joins the stem.

Roots:

Sesame has a fibrous root system that helps anchor the plant in the soil and absorb water and nutrients. The roots spread out horizontally and penetrate the soil to varying depths.

Leaves:

The leaves of sesame are simple, alternate, and oval-shaped. They have a smooth texture and are green in color. The leaf arrangement is opposite along the stem. The leaves play a crucial role in photosynthesis, capturing sunlight to produce energy for the plant.

Inflorescence:

Sesame produces bell-shaped inflorescences that emerge from the leaf axils (where the leaf stalk joins the stem). These inflorescences are white and typically measure 1 to 2 inches (about 2.5 to 5 cm) in length. Each

inflorescence contains one to three flowers. The flowers are hermaphroditic, meaning they have both male and female reproductive parts.

Calyx: The calyx is the outermost whorl of the flower. In sesame, it consists of five sepals. The aestivation (arrangement of sepals in the bud) is valvate, meaning the sepals overlap at the margins.

Corolla: The corolla is the second whorl of the flower. In sesame, the corolla is tubular and campanulate (bell-shaped) with a long lip. The aestivation of the corolla is vexillary, which means the petals overlap in a specific way.

Androecium: The androecium refers to the male reproductive organs (stamens) of the flower. In sesame, there are ten stamens. These stamens consist of a filament (stalk) and an anther (where pollen is produced).

Gynoecium: The gynoecium represents the female reproductive organs of the flower. It includes the ovary, style, and stigma. The ovary contains ovules, which develop into seeds after fertilization. The style connects the ovary to the stigma, where pollen grains land during pollination.

Fruit: The sesame plant (*Sesamum indicum*) produces elongated fruit pods that resemble okra. These pods contain edible seeds. When mature, the pods burst open, scattering the seeds for proliferation.

Seeds: Sesame seeds are found inside these fruit pods. They are small, oval, and measure about 1/8 inch in length. The hulled seeds are creamy or pearly white and have a flattened pear shape. They are very oily and sticky.

Wild relatives of sesame:

- *Sesamum alatum*
- *Sesamum latifolium*
- *Sesamum angolense*

- *Sesamum calycinum*
- *Sesamum angustifolium*
- *Sesamum radiatum*

SESAME POLLINATION

Sesame (*Sesamum indicum*) demonstrates intriguing pollination dynamics. Within its flowers, both male and female structures coexist, enabling self-pollination. However, sesame also engages in cross-pollination facilitated by insects, leading to enhanced seed weight per plant and the amalgamation of desirable traits for crop improvement. Insects such as bees, beetles, moths, butterflies, and flies serve as primary pollinators, with bees notably contributing 80-90% to sesame pollination. This insect-mediated process not only ensures successful seed production but also offers benefits for farmers.

Sesame rotation in cropping systems aids in pest management by disrupting pest cycles, while promoting pollinator populations and reducing reliance on insecticides. Notably, cross-pollinated sesame exhibits higher yields compared to self-pollinated variants, resulting in increased profits per acre. In essence, while sesame possesses inherent self-pollination capabilities, its reliance on insect pollinators, particularly bees, underscores the significance of their role in sesame seed production and agricultural sustainability.

ADVANTAGES OF SESAME:

1. Good Source of Fiber: Sesame seeds are rich in fiber, providing 3.5 grams of fiber per 3-tablespoon (30-gram) serving. This amount accounts for 12% of the Reference Daily Intake (RDI).

Adequate fiber intake is essential for digestive health, and it may also help reduce the risk of

heart disease, certain cancers, obesity, and type 2 diabetes.

2. Cholesterol and Triglyceride Reduction:

Regularly consuming sesame seeds may help lower cholesterol and triglyceride levels, which are risk factors for heart disease.

Sesame seeds contain polyunsaturated and monounsaturated fats, which can contribute to improved cholesterol profiles.

Additionally, sesame seeds contain plant compounds like lignans and phytosterols, known for their cholesterol-lowering effects.

3. Nutritious Plant Protein:

A 3-tablespoon serving of sesame seeds provides 5 grams of protein. Opt for hulled, roasted sesame seeds to maximize protein availability. While sesame seeds are low in lysine (an essential amino acid), vegans and vegetarians can compensate by consuming high-lysine plant proteins from sources like legumes.

4. Rich in Vitamins and Minerals:

Sesame seeds are a good source of calcium, vitamin E, and B vitamins. These nutrients play essential roles in overall health and well-being.

LIMITATION OF SESAME:

1. Allergic Reactions: Despite their nutritional benefits, sesame seeds can trigger allergic reactions in susceptible individuals. These allergies range from mild itching to severe anaphylaxis, posing a significant limitation for those with sensitivities.

2. Oxalate Content: Sesame seeds contain oxalates, compounds known to contribute to the formation of kidney stones in some individuals.

Excessive consumption may exacerbate kidney stone formation, necessitating moderation for those prone to such conditions.

3. High Caloric Density: While sesame seeds boast a plethora of nutrients, they also harbor a high caloric density. This characteristic poses a limitation for individuals aiming to manage their weight, as excessive consumption may lead to calorie surplus and weight gain.

4. Potential Contamination: The cultivation and processing of sesame seeds may involve the risk of contamination with allergens, pesticides, or pathogens. Ensuring the purity and safety of sesame products becomes challenging, posing a limitation in terms of food safety.

5. Limited Bioavailability of Nutrients:

Despite their nutrient-rich profile, sesame seeds contain phytic acid and other compounds that may inhibit the absorption of minerals such as calcium, zinc, and iron. This limitation underscores the importance of diversifying nutrient sources to optimize absorption.

6. Susceptibility to Rancidity:

Due to their high oil content, sesame seeds are prone to rancidity when exposed to oxygen and light. Proper storage techniques are necessary to maintain freshness and prevent the development of off-flavors.

7. Not Suitable for Raw Consumption by Some:

Raw sesame seeds contain compounds known as oxalate crystals, which may cause discomfort or irritation in the mouth and throat when consumed in large quantities. This limitation prompts caution, particularly for individuals with sensitivities or oral health issues.

8. Potential Allergen Cross-Contamination:

The widespread use of sesame seeds in various food products increases the risk of allergen cross-contamination, posing a

challenge for individuals with sesame allergies to navigate food choices safely.

9. Environmental Impact of Cultivation: Like any crop, sesame cultivation has environmental implications related to water usage, soil health, and land management. Sustainable practices are essential to mitigate these impacts.