



Phytochemicals, Nutrients, and Classification of Corn.

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Abstract

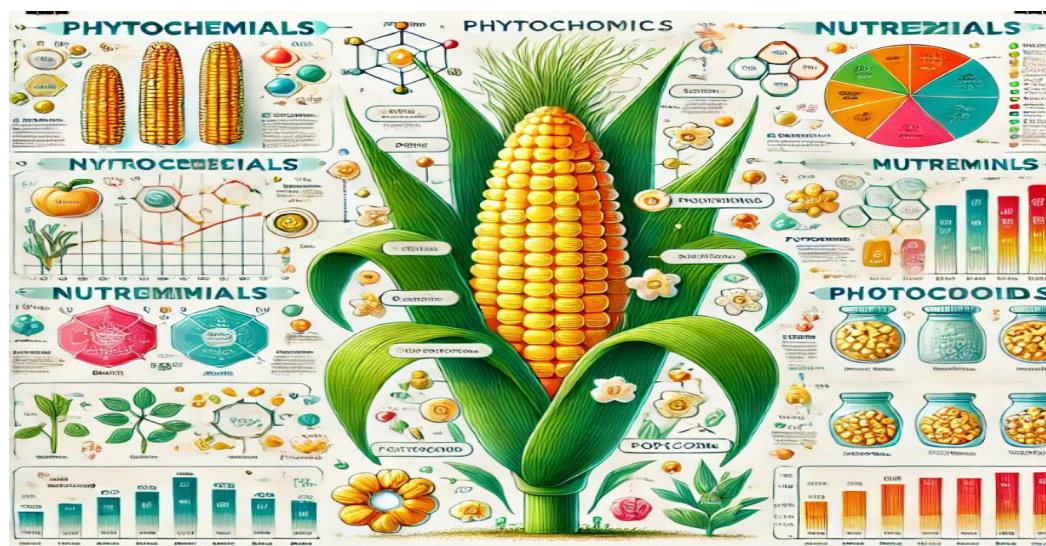
Background

The preface of Whole grains and its health benefits Whole grains, similar as sludge, correspond to an admixture of phytochemicals with implicit health-promoting parcels. Similar chemicals may be considered to dwindle the threat of habitual conditions and heart complaint, type 2 diabetes, and rotundity. Nutritive particularity of sludge sludge is among the most consumed grains, with its oneness lying in terms of the combination of the nutrients and phytochemicals that have no equal among other grains. It contains all the essential vitamins, minerals, and bioactive composites that compound health. Nutrients in Corn Vitamins The grains have a plurality of vitamins A, B, E, and K. All these are important for vision, metabolism of energy, impunity system regulation, and forestallment of oxidative damage. Conclusion The part of Corn in a Healthy Diet Corn, with all the variety of nutrients and phytochemicals, can dwindle the pitfalls of habitual conditions and digestion health when included in a well-balanced diet. Further exploration is demanded because, so far, substantiation has only been growing in understanding what the numerous composites of sludge do biologically to the mortal body over time.

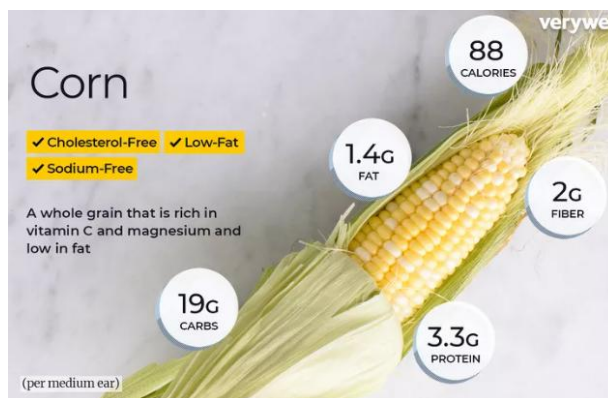
Key words: Corn, Phytochemicals , nutrient, types and Health

Introduction

Corn, also known as maize, is a staple food crop and a major source of calories for millions of people worldwide. Belonging to the Poaceae family, corn is cultivated for various purposes, including food, feed, and industrial applications. This review aims to provide an in-depth understanding of the phytochemicals and nutrients found in corn and its classification based on kernel characteristics and uses. A comprehensive examination of its nutritional and functional properties highlights its role in promoting health and sustainability. Corn can be classified on the basis of endosperm and kernel composition viz. flint corn kernels, dent corn, floury corn, waxy corn, pop corn and sweet corn. Corn can be processed by using dry or wet milling to produce diverse food ingredients such as corn meal, corn grit, corn fiber, corn oil etc. It has been established that research is still required in order to fully understand the composition, types and milling process of the corn in order to help food technologist. Therefore, it was the aim of this investigation to review the types of corn, its nutrition and types of milling.



Phytochemicals in Corn



Phytochemicals are bioactive compounds in plants that contribute to health benefits beyond basic nutrition. Corn contains several key phytochemicals:

1. Phenolic Compounds

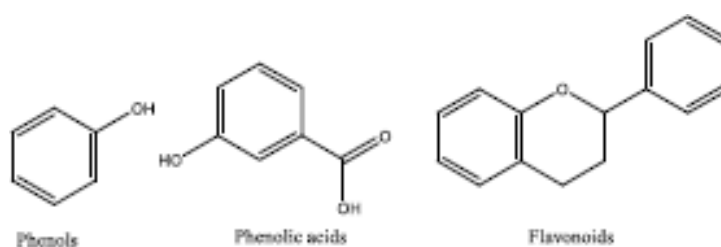


Fig. 1. Structures of common phenolic compounds.

Phenolic acids such as ferulic acid and p-coumaric acid are abundant in corn. These compounds exhibit potent antioxidant properties, protecting cells from oxidative damage.

They are mainly divided into phenolic acids, flavonoids, cetin, coumarins and tannins. Among the phenolics, flavonoids and phenolic acids are the main rudiments in sludge. The total phenolic content varied among sludge kinds and ranged from 243.8 ± 4.6 to 320.1 ± 7.6 mg gallic acid rivals per 100 g dry weight (DW) of sludge.

- **Ferulic Acid:** Found in the cell walls of corn kernels, ferulic acid helps reduce inflammation and oxidative stress.
- **p-Coumaric Acid:** Contributes to antimicrobial and anti-inflammatory activities.

2. Carotenoids

Carotenoids, including lutein and zeaxanthin, are present in high concentrations in yellow corn. These compounds play a crucial role in eye health by preventing macular degeneration and cataracts. Carotenoids are natural colors set up in pusillanimous, orange and red colors. Further than 700 carotenoids have been set up in nature. Their health support system is provitamin A and acts as an anti-seditious agent to count oxygen free revolutionaries. Carotenoids generally have a backbone of 40 carbon isoprene units ringed at one or both ends. Utmost carotenoids set up in nature are in trans form. Due to the long double bond chain in the middle of their chemical structure, carotenoids cortege light absorption and a pronounced single-line oxygen quenching capability. Carotenoids are fat-answerable mixes, so the absorption of carotenoids requires 3 – 6 grams of fat/ liquid in the diet. Processes analogous as mechanical homogenization and heat treatment can increase the bioavailability of carotenoids.

3. Flavonoids

Flavonoids such as anthocyanins are prominent in pigmented corn varieties like blue and purple corn. These provide antioxidant and anti-inflammatory benefits, contributing to cardiovascular health. Flavonoids are classified as flavonols, flavonoids, flavanols, flavanones, anthocyanins, and isoflavonoids according to their C ring structures. There are multitudinous differences in the flavonoid contents of sludge kinds, the most consumed sludge, with the total flavonoid content in pusillanimous sludge being roughly 1.68 ± 0.17 asset catechin rivals g. ultimate of them are in set form (1.52 ± 0.03 asset catechin rivals g) and a small amount is in free form (0.16 ± 0.004 asset catechin rivals g) (30). Answerable flavonoids appear grandiloquent to red with adding pH and attention. sludge cocoon has the topmost anthocyanin content (up to 50) and the aleurone caste contains small amounts of anthocyanins.

4. Phytosterols

Corn contains phytosterols, plant-derived sterols that help lower cholesterol levels by competing with cholesterol absorption in the intestine. Their structure is similar to cholesterol, only their lines are different. They are the main components of plant cell walls and cell membranes. According to the minor components in corn oil, phytosterols are divided into the following groups: 4-desmethyl sterols, simple sterol, 4,4-methyl sterol, 4-monomethyl sterol and sitosterol. The phytosterol content of corn crude oil (8.09-15.57 g/kg) is higher than that of refined oil (7.15-9.52 g/kg)

Nutrients in Corn

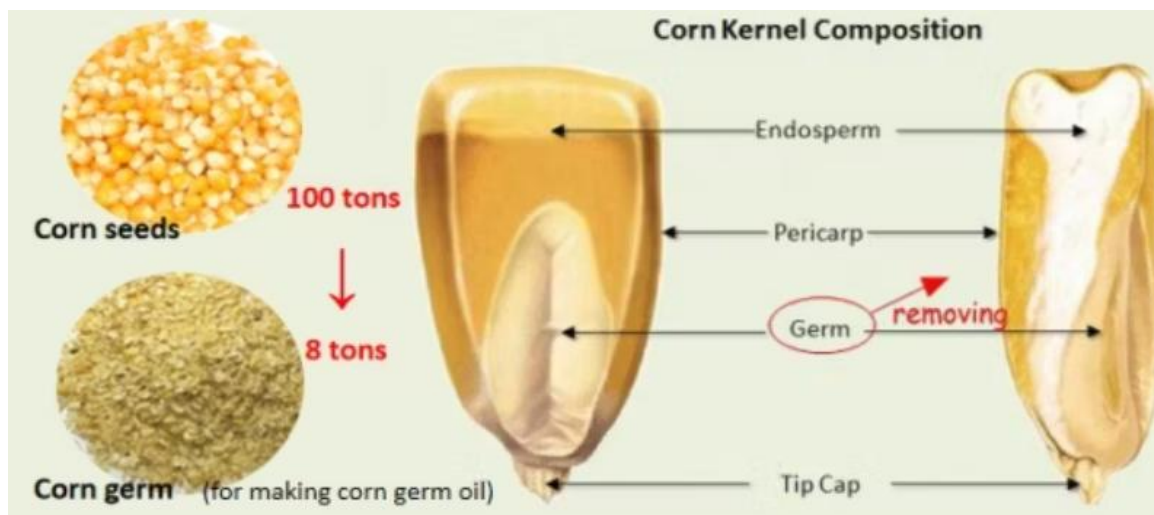


Table 1: Nutritional Composition of Corn (per 100g)

Nutrient	Amount
Energy	86 kcal
Carbohydrates	19 g
Protein	3.2 g
Fat	1.2 g
Fiber	2.7 g

Corn is a rich source of essential nutrients, offering macronutrients, micronutrients, and dietary fiber:

1. Macronutrients in sludge give 366 calories per 100 grams of sludge, and 87 calories per 100 grams of sweet sludge. The main constituents in sludge are carbohydrates and water. Sludge contains about 75 carbohydrates, and sweet sludge contains about 19 carbohydrates. The humidity content of sludge is about 10, and sweet sludge is about 76. Sludge and sweet sludge give numerous vitamins.

- **Carbohydrates:** Corn is predominantly composed of starch, making it an excellent source of energy.
- **Proteins:** Contains moderate amounts of protein, with zein being the primary storage protein.
- **Fats:** Low in fat, but contains unsaturated fatty acids, particularly linoleic acid.

2. Micronutrients

- **Vitamins:** Corn is a source of B-complex vitamins, including thiamine (B1), niacin (B3), and folate (B9). Yellow corn contains beta-carotene, a precursor to vitamin A.
- **Minerals:** Provides potassium, magnesium, phosphorus, and trace amounts of iron and zinc.

3. Dietary Fiber

Corn contains both soluble and insoluble fiber, which aids in digestion, regulates blood sugar levels, and supports heart health.

Classification of Corn

Type	Key Features	Common Uses
Sweet Corn	High sugar, soft kernels	Fresh consumption
Field Corn	High starch, hard texture	Feed, ethanol
Flint Corn	Hard outer shell, colorful	Traditional dishes
Popcorn	Explosive expansion on heat	Snacks
Dent Corn	Indented kernels, versatile	Food processing, feed

Corn can be classified based on its kernel characteristics, botanical attributes, and end-use applications:

1. By Kernel Type

- **Dent Corn:** Characterized by a dent in the top of the kernel, used for animal feed and industrial applications.
- **Flint Corn:** Hard, glassy kernels with a high starch content, commonly used in traditional dishes.
- **Popcorn:** Small, hard kernels that expand when heated due to moisture within.
- **Sweet Corn:** Known for its high sugar content, consumed as a vegetable.
- **Flour Corn:** Soft starch kernels, used to make corn flour.
- **Pod Corn:** A rare type where each kernel is enclosed in a husk.

2. By Color

Yellow Corn: Rich in carotenoids like beta-carotene.

White Corn: Lacks carotenoids, preferred in certain culinary traditions.

Pigmented Corn: Red, blue, or purple varieties rich in anthocyanins.

3. By Botanical Category

Corn is classified under the genus *Zea* and species *Zea mays*, further divided into numerous subspecies and cultivars adapted to specific climatic and soil conditions.

Health Benefits of Corn is rich in nutrients and bioactive compounds, including fiber, vitamins, minerals, and phytochemicals. There is growing scientific evidence that regular consumption of whole grains may reduce the risk of chronic diseases such as heart disease, type 2 diabetes, obesity and obesity, and digestive disorders.

The phytochemicals and nutrients in corn contribute to several health benefits:

- **Antioxidant Properties:** Phenolic compounds and carotenoids help neutralize free radicals, reducing the risk of chronic diseases.

1. Rich Source of Carotenoids Corn contains carotenoids such as **lutein** and **zeaxanthin**, which are antioxidants known to promote **eye health**. They protect against macular degeneration and cataracts by filtering harmful blue light.

2. Vitamin E Content Corn provides **vitamin E**, a fat-soluble antioxidant that supports **skin health**, strengthens the immune system, and helps protect cells from oxidative stress.

3. Phenolic Compounds Corn is a good source of **phenolic compounds** like **ferulic acid**, which has anti-inflammatory and anticancer properties. It helps combat chronic diseases such as heart disease and diabetes.

- **Eye Health:** Lutein and zeaxanthin protect against macular degeneration. Corn contains **lutein** and **zeaxanthin**, two powerful antioxidants that are part of the carotenoid family. These compounds are concentrated in the macula of the eye and play a vital role in:
- **Protecting against macular degeneration:** They help filter harmful blue light and reduce oxidative damage, lowering the risk of age-related macular degeneration (AMD), a leading cause of vision loss.

- **Reducing cataract risk:** Studies suggest that higher intake of lutein and zeaxanthin is associated with a lower risk of cataracts.
- **Cardiovascular Health:** Phytosterols lower cholesterol levels, and fiber supports heart health. According to the World Health Organization report, 17.7 million people died of CVD in 2015 and 23 million people will die of CVD worldwide each year by 2030 [84]. Several recent epidemiological studies and clinical trials have shown an association between the consumption of whole grains and whole grain products and a reduced risk of CVD [5–7,85,86].
- **Digestive Health:** Dietary fiber promotes gut health and regular bowel movements. Eating 20 grams of starch per day is beneficial to health [103]. According to the USDA National Nutrient Database, white and yellow corn contain 7.3 grams of fiber per 100 grams [104]. Less than 4% of the US population meets the recommended dietary fiber intake of 14 g per 1000 kcal, which is 25 g per day for adult women and 39 g per day for adult men.

1. High Fiber Content

Insoluble Fiber: Corn is rich in insoluble fiber, which adds bulk to stool and promotes regular bowel movements. This helps prevent constipation.

Soluble Fiber: Although present in smaller amounts, soluble fiber in corn supports the growth of beneficial gut bacteria by acting as a prebiotic.

2. Prevention of Constipation

The fiber in corn helps maintain smooth digestion and reduces the risk of constipation by ensuring adequate stool bulk and motility.

3. Gut Microbiome Support Whole corn, especially varieties like cornmeal or popcorn, contains resistant starch and other fermentable fibers. These compounds act as fuel for probiotics, enhancing gut health.



Conclusion

Corn is a versatile and nutritionally rich cereal crop with significant health and economic benefits. Its phytochemicals, such as phenolic acids and carotenoids, along with essential nutrients like vitamins, minerals, and dietary fiber, make it a valuable dietary component. The classification of corn based on kernel type, color, and use highlights its adaptability and diverse applications in food, feed, and industry. Continued research on corn's bioactive compounds and nutritional properties will further enhance its role in promoting health and sustainable agriculture.

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