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Exploring the benefits of fresh green coffee as a healthier alternative to caffeine

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Abstract

The majority of people drink coffee to start their day. Many would also drink coffee to wrap up their work each day. Coffee consumption is therefore a significant aspect of contemporary daily life. Coffee is said to have an alerting effect on the human brain, which is why scientists believe that humans are driven to develop science. Coffee intolerance may vary from person to person, though, as some claim to have irregular heartbeats or headaches as a result of drinking coffee. Coffee contains more caffeine than any other food item because it is a naturally occurring alkaloid. Diterpenes, phenolic chlorogenic acid, and caffeine are among the many compounds that make up this complex mixture. Coffee contains potassium, niacin, magnesium, and antioxidants like tocopherols in addition to these and other ingredients, which may be involved in its biological activity. Green coffee contains polyphenol compounds, which are a natural source of antioxidants and primarily consist of chlorogenic acid. *Coffea Arabica* (Arabica) and *Coffea canephora* (Robusta) are the two commercially available varieties of green coffee beans. Green coffee's abundance of potent phytochemicals gives it its characteristics. This investigation aimed to identify the components and properties of green coffee bean extracts.

Keywords: Coffee Arabica, green coffee, coffee canephora, phytochemicals, alkaloid

Introduction

Coffee is a relatively new beverage, having been discovered only in the 17th century. Since the early 20th century, coffee-which was once only drunk by the upper class-has grown to become one of the most widely consumed drinks worldwide and has become ingrained in our daily routines and way of life (Chahan-Yeretian, January 2017) [4]. Coffee is a beverage made from the roasted and ground seeds of African-originated tropical evergreen coffee plants. Coffee ranks among the top three beverages consumed globally, after water and tea, and is also one of the most profitable commodities on the international market (www.britannica.com). Coffee, which is dark in color, bitter, and slightly acidic, stimulates people mainly because of the caffeine it contains (www.wikipedia.com). Numerous highly significant functional ingredients, including flavonoids (Catechins and anthocyanins), caffeic and ferulic acid, are found in coffee brew. Other physiologically active substances in coffee include caffeine, pyrogallol acid, quinolinic acid, nicotinic acid, and trigonelline (Chris Meletis, February 2006) [5].

A popular beverage known for its health-promoting qualities is an infusion of green coffee. Green coffee's abundance of potent phytochemicals gives it its characteristics. Chlorogenic and caffeic acids, which have antimutagenic, anticancer, antibacterial, and antioxidative properties, are the primary phenolic components found in green coffee beans. The majority of phenols in green coffee beans are connected to sugars as glycosides. According to (Anna Masek, Malgorzata Latos-Brozio, Joanna Kałużna-Czaplińska, Angelina Rosiak, and Ewa Chrzescijanska, 2020) [1] phenolic acids like chlorogenic, ferulic, and caffeic acid are found as an ester attached to the cell wall, resulting in extremely complex polysaccharide structures. Simply put, green coffee is made from ordinary, raw coffee beans that haven't been roasted yet. Roasting is the only process that gives picked and processed coffee beans their well-known brown hue (Joel Fuster, March 6, 2021). Though green coffee is commonly consumed as a dietary supplement, it can also be bought in whole beans and brewed hot, much like roasted coffee (Ansley Hill, RD, LD, September 18, 2019) [2].

Botanical name of green coffee: *Coffea Arabica* is the botanical name for coffee. It is *Coffea Arabica* which is responsible for approximately 60-80% of coffee production all over the world.

Scientific classification of green coffee

Kingdom: Plantae
Clade: Tracheophytes
Clade: Angiosperms
Clade: Eudicots
Clade: Asterids
Order: Gentianales
Family: Rubiaceae
Genus: coffea
Species: C. Arabica

History of coffee: Around 850 AD, the ancient coffee forests on the Ethiopian plateau are where coffee originated and from which coffee is grown today. It is said that Kaldi, a goat herder, first realized the potential of these well-loved beans there. According to legend, Kaldi found coffee when he noticed that his goats were so animated at night after consuming the berries from a particular tree that they were refusing to sleep. After hearing about Kaldi's research, the local monastery's abbot drank a beverage made from the berries and discovered that it helped him stay awake during

the lengthy evening prayers. The berries were discovered and then word of them spread among the other monks at the monastery thanks to the abbot's sharing of his discovery. Coffee started a journey that would take these beans all over the world when word spread east and reached the Arabian Peninsula (www.ncausa.org).

Coffee Production - India

- The state of Karnataka produces the most coffee in India. Kerala is the state that produces the greatest amount of coffee in India, following Karnataka. About 21% of India's coffee is produced in Kerala.
- About 90% of India's total coffee production comes from Kerala and Karnataka combined.
- Tamil Nadu is India's third-highest producer of coffee, making up 5% of the country's total output.
- Andhra Pradesh, Odisha, and Northeastern India are other regions where coffee is grown.
- Robusta and Arabica are the two most well-known varieties of coffee grown in India; the latter was brought to the Baba Budan Giri hill ranges of Karnataka in the seventeenth century.
- India is a major exporter of coffee to a number of nations, including the USA, the UK, Germany, France, Russia, Spain, Slovenia, Belgium, & the Netherlands.

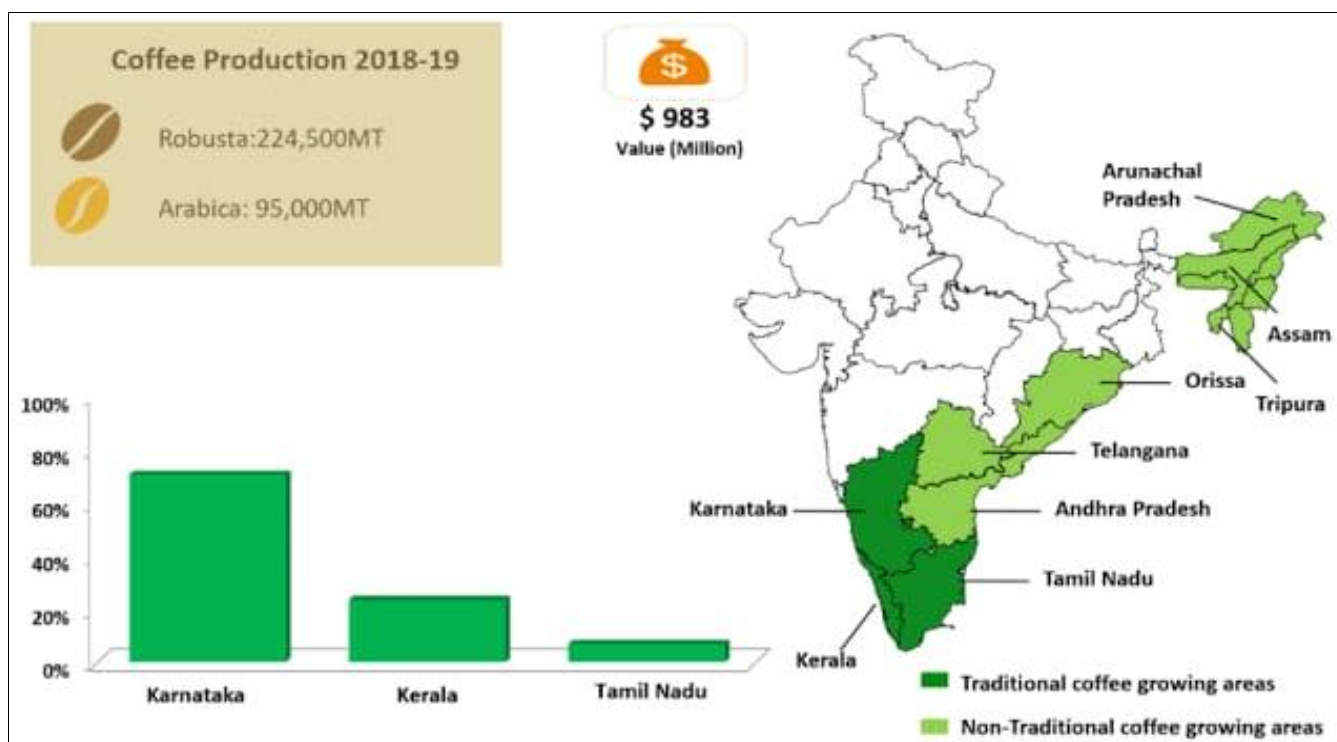


Fig 1: India coffee market-key data

Botany and Origin

The first botanical description of the coffee tree, known as *Jasminum arabicum*, was published in 1713 by Antoine de Jussieu, who had studied a single plant housed at the Amsterdam Botanic Garden. Linnaeus later categorized the species as *Coffea arabica* in the genus *Coffea* in 1737. Since then, a large number of additional *Coffea* species have been found and described through rigorous taxonomic work; more recently, the genus *Psilanthus* has been merged into *Coffea* due to molecular studies. The Rubiaceae family includes the tropical woody genus *Coffea*. Although there are reports of wild populations as well, the highlands of southwest Ethiopia

and the Boma plateau of South Sudan are the primary centers of origin for *C. arabica*.

According to Davis *et al.* (2006) [6], *C. canephora* is found much more widely, ranging from West to East Africa in Ghana, Guinea, Guinea Bissau, Cote d'Ivoire, Liberia, Nigeria, Cameroon, Congo, Central African Republic, Democratic Republic of Congo, Gabon, Sudan, South Sudan, Tanzania, and Uganda, and as far south as Angola. According to Lashermes *et al.* (1999), *Coffea arabica* is an allotetraploid ($2n = 4x = 44$) that descended from two distinct diploid ($2n = 2x = 22$) wild ancestors, *C. canephora* and *C. eugenioides* S. Moore, or ecotypes associated with these two species. The

genetic diversity of Arabica coffee is extremely low because of its origin, reproductive biology, evolution, and limited gene pool from which it spread globally. About 90% of the flowers undergo self-fertilization, which is how it primarily reproduces and is self-compatible.

Growing at an elevation of 1,300 to 2,000 meters above sea level, the Arabica coffee tree is a small tree that has the potential to grow to a height of 9 to 12 meters in the wild. The coffee plant takes around three years to reach full maturity, from seed germination to first fruit production.

The seed inside the cherry-shaped coffee fruit is referred to as the bean. The fruit's components are the endocarp (Parchment), mesocarp (Pulp), integument (Silverskin), endosperm (Bean), and embryo. With an initial vertical (Orthotropic) stem that gives rise to primary plagiotropic branches from "head of series" buds, the tree features an open branching system. From primary branches arise secondary branches, followed by tertiary and quaternary branches. The four to six serial buds generate either flowers or orthotropic suckers. The leaves are opposite, dark green, shiny, and waxed. The flower consists of white, five-lobed corolla, a calyx, five stamens, and the pistil. The ovary at the base of the corolla consists of two ovules, which when fertilized become two coffee beans.



Fig 2: Coffee making Procedure

Table 1: How green coffee is better than regular coffee

| | Green coffee | Regular coffee |
|--------------------------------|---|--|
| Flavor | Much milder, lighter than regular coffee | Can range from fruity, floral, sweet, nutty, chocolatey to winey. |
| Color/Beans | Green color is due to roasting process. | Color changes from tan to brown and dark brown is due to Roasting process. |
| Caffeine content | A typical 8-oz cup of green coffee contains about 100 mg of caffeine. | A typical 8-oz cup of regular instant coffee contains about 62 mg of caffeine. |
| Chlorogenic acid- antioxidants | Chlorogenic acid present is comparatively high | Chlorogenic acid present is comparatively low. |
| Serving per day | Not more than 2 cups are recommended per day | 4-5 cups are recommended per day |

Antioxidants properties of green coffee

Green coffee has a somewhat distinct flavor that is best described as light, delicate, and slightly tart. Although the flavor is not as potent or strong as roasted coffee, it is still enjoyable (Dropofdrin, January 9, 2023) [13]. This study set out to identify the constituents and characteristics of green coffee bean extracts:

- Phenolic compounds found in abundance in green coffee beans are involved in the bean's capacity to scavenge reactive oxygen species. According to Dziki *et al.* (2015) [16] and Forino *et al.* (2015) [18], the primary phenolic components of green coffee, chlorogenic and caffeic acids, have antimutagenic, anticarcinogenic, antibacterial, and antioxidant properties.
- The majority of phenolic compounds in green coffee beans, however, are conjugated to sugars as glycosides. Highly complex polysaccharide structures are formed when compounds like caffeic, ferulic, and chlorogenic acids are found in an ester form attached to cell walls (Asther *et al.*, 2002, Ferreira *et al.*, 2013) [3, 7].
- Natural antioxidants can be found in abundance in green coffee. Chlorogenic acid is the active ingredient responsible for the health benefits of green coffee beans. Chlorogenic acids typically make up 5 to 12 grams per 100 grams of green coffee beans. Cinnamic acids with antioxidant and anti-inflammatory qualities are known as chlorogenic acids. Therefore, the manufacturing of nutraceuticals also makes use of green coffee extracts. Green coffee contains four main types of chlorogenic acids: coumaroylquinic, dicaffeoylquinic, feruloylquinic,

and caffeineoylquinic acids. Caffeoylferuloylquinic acids are small chlorogenic compounds found in species such as *Coffea canephora* (Robusta), (Soundharya M.G, 2023) [18].

Health benefits of green coffee (www.nurturic.com)

Increased blood circulation is one of the health benefits of green coffee. Another is that the extract from green coffee beans contains chlorogenic acid, which is known to boost metabolism. It also helps to lower blood sugar, reduce stress and oxidative damage, detoxify the liver, increase energy levels, support heart health, maintain healthy skin, slow down the aging process, improve brain function, and treat mood disorders.

What happens if green coffee is taken too much?

- Dr. Simran Saini of Fortis Hospital in New Delhi states, "After consuming one or two cups of green coffee per day, some people have complained about digestive problems like cramps in their abdomens and loose motions. So, if you frequently get upset stomach issues, I would advise you to stop using it right away. "Also, avoid having green coffee right after your meals," she continues. People's bodies have less hemoglobin because it interferes with the absorption of vital minerals like iron and folic acid. It is always best to consume it at least an hour before or after eating. Avoid exceeding two glasses of liquid per day".
- Caffeine is another adverse effect of green coffee. Caffeine overuse may not be beneficial to your health.

Caffeine intake in excess can be harmful, particularly for those who suffer from anxiety, diabetes, irritable bowel syndrome, high blood pressure, or osteoporosis.

- Excessive intake of green coffee can result in symptoms like headache, upset stomach, restlessness, insomnia, and anxiety, even if you do not have any chronic conditions. Should you intend to transition to green coffee in the near future, consult a nutritionist or other health professional? Avoid consuming more than two cups of it per day and see a doctor right away if you experience any severe symptoms (Sarika Rana, August 30, 2017) ^[17].

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