

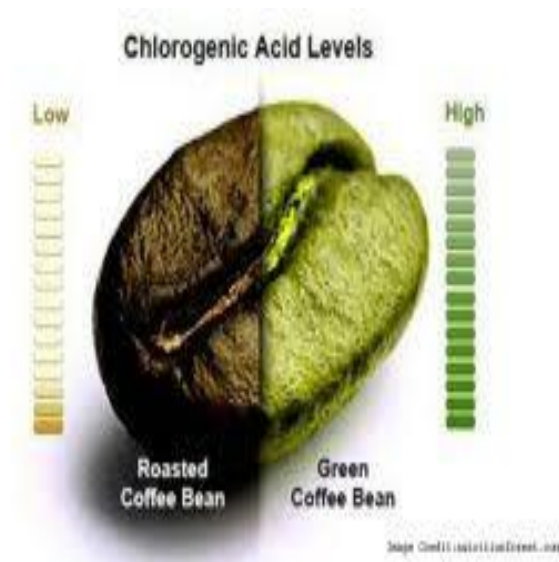


Cihan University - Erbil

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Nutrition Department

Chlorogenic Acids and its Health Benefits



Seminar By

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Introduction



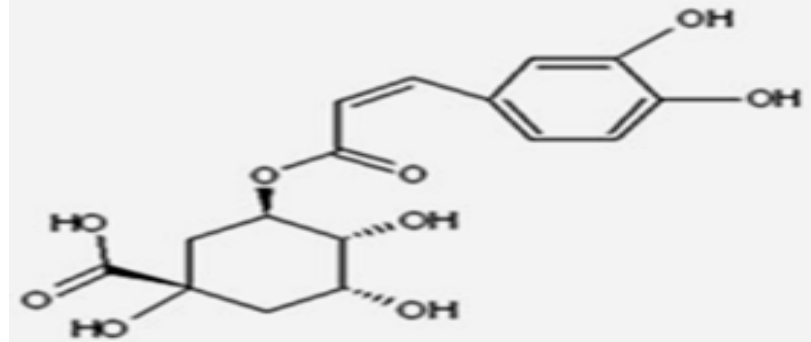
Chlorogenic acids (CGA) are phenolic compounds with variety of health benefits such as reducing the relative risk of cardiovascular, type 2 diabetes and Alzheimer's diseases, and antibacterial and anti-inflammatory activities.

Coffee is the most popular beverage, it contains Caffeine which is an alkaloid usually 0.9 - 2.5 % of coffee dry matter.

While caffeine has been widely consumed and studied for centuries, the findings of studies on both adverse and beneficial caffeine relationships to many health outcomes are inconclusive.

On the other hand green coffee is a major source of CGA which used for nutraceuticals production. There are nevertheless data on human bioavailability of CGA from green coffee.

Chemical composition of Chlorogenic acids



Structurally, Chlorogenic acid is the ester formed between certain trans cinnamic acid and (L)-quinic acid.

Phenolic acids exist commonly in nature as mixtures of esters, ethers, or free acids.

Caffeic, ferulic and p-acids are phenolic compounds derived from cinnamic acid which naturally exist under the common name of chlorogenic acids in the form of mono- or di-esters with aliphatic alcohols of (-)-quinic acid. Caffeoyl-quinic acids (CQA), dicaffeoyl-quinic acids (diCQA), feruloyl-quinic acids (FQA), and p-coumaroyl-quinic acids (pCoQA) are the major subgroups which comprise 98% of all CGA.

Natural sources of CGA



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Coffee is one of the world's most widely-consumed food items, Brazil is the largest producer and exporter of green coffee, which accounts for about 35 % of world demand. Meanwhile Yemen Coffee is the oldest ones with very high quality especially the species *Coffea arabica*. The principal phenolic compounds in coffee are chlorogenic acids (CGA), in green coffee, with at least three isomers.

The effect of processing (Roasting of coffee) on Chlorogenic Acids



As a result of Maillard reaction bitterness increases during coffee roasting due to release of caffeic acid and production of lactones and other phenol derivatives responsible for flavoring and aroma.

CGA and their lactones not only contribute to the taste of coffee they also has potential bio-pharmacological value to humans. High roasting process temperature allows CGA carbon-carbon bonds to break, leading to isomerization and degradation.

Optimum degree of roasting in coffee to produce a sufficient volume of lactones is light medium roasting (14 % weight loss), whereas darker roasting yields lower quantities.

Concentration of CGA in Coffee



Some studies reported that CGA is widely distributed in plant materials such as green coffee content which is the highest concentration found ranging from 4 to 14 % (In high quality Brazilian Coffee), another studies reported that, the average CGA content ranged from 6.1 ± 0.7 to 6.6 ± 1.1 g / 100 g (dry weight) in all cultivars and crops. Meanwhile, an analysis has been carried out to determine the chemical composition of Yemeni green coffee, the concentration of CGA ranged from 4.24 ± 0.33 to 11.62 ± 0.32 % and the average was 7.19 ± 0.4 %.

Some Health Benefits of CGA -1



Phenolic compounds are ubiquitous constituents of higher plants present in wide range of widely consumed plant foods such as fruits, vegetables, cereals and legumes, and in plant-derived beverages such as wine, beer, tea and coffee.

The principal phenolic compounds in coffee are CGA in green coffee with at least three isomers. Such compounds are secondary metabolites in coffee plants, which play a function role against pathogen attacks, plant competition, which attraction of beneficial organisms such as pollinators, seed dispersers, and symbiotic microorganisms. These also provide protection in relation to abiotic stresses, such as those associated with temperature increases, water content, UV light exposure and mineral nutrient deficiency. In addition, CGA contributes to the taste of the drink and has a strong effect on coffee cup quality determination.

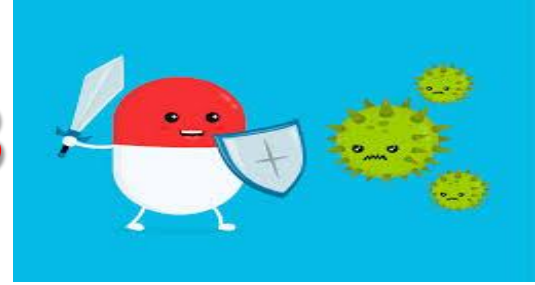
Some Health Benefits of CGA-2



Chlorogenic acids are phenolic compounds with variety of health benefits have been linked with CGA intake, to reducing the relative risk of diseases (cardiovascular, type 2 diabetes and Alzheimer's), and antibacterial and anti-inflammatory activities.

CGA and many other compounds of polyphenol are commonly used in medical and industrial applications such as consumer products and food industries . CGA are using in drinks, cosmetics, tea products and foods as well as in medical substances , for various additives. CGA are natural antioxidant and anticancer agents with antibacterial and antiviral properties. It is also precursor of compounds for medicinal products that can work against AIDS HIV virus.

Some Health Benefits of CGA-3



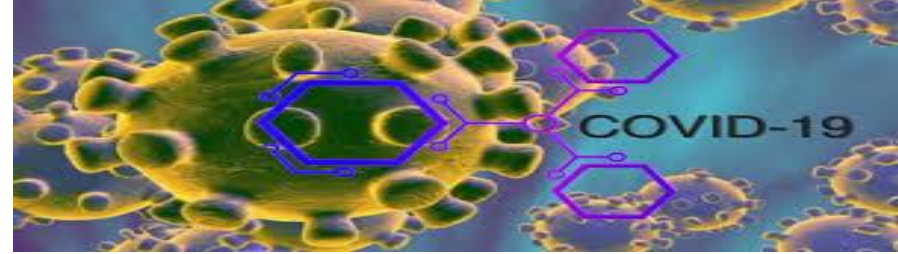
In recent years, CGA has been the subject of many studies among other beneficial effects including their potentially beneficial effects on humans concerning their antioxidant activity. Researchers have been trying to classify the cultivars for this purpose. Arabica (a coffee species with more noble sensory characteristics) which can simultaneously give good cup quality and have a high CGA content. Also, variety of health benefits have been associated with CGA uses, such as reduction of the relative risk of many diseases, with anti-oxidants, anti-bacterial and anti-inflammatory properties. It has also been shown that their lactones exert beneficial effects in rats, such as enhancing insulin action. The researchers, showed that humans strongly absorb and metabolize the main CGA compounds present in green coffee.

Some Health Benefits of CGA-4



Green coffee beans produce the highest quantities of plant CGA varying from 6 to 12 %. Studies of these compounds have identified many pharmacological properties such as antioxidant activity, ability to increase the use of hepatic glucose, HIV-integrates inhibition, antispasmodic activity, and mutagenicity inhibition of carcinogenic compounds. Green (or raw) coffee is a significant naturally occurring CGA source (5–12 g /100 g). Recent studies showed that the intake of green coffee extracts has an antihypertensive effect in rats and humans, an increase in human vasor-function, an inhibitory effect on fat accumulation and body weight in mice and humans, and a regulation of human glucose metabolism. These biological effects were due to CGA found in green coffee.

Chlorogenic Acids and Coronavirus

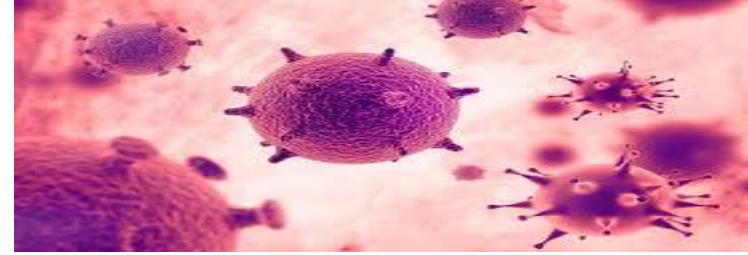


Regarding to a study by (Yu *et al.*, 2020) reported that phillyrin and chlorogenic acid could block the combination of 2019-nCoV S-protein and Angiotensin Converting Enzyme (ACE2) at the molecular level. Both can be used as potential inhibitors of 2019-nCoV for further research and development.

<https://doi.org/10.26434/chemrxiv.11882838.v1>

Meanwhile another study by (Weng, *et al.*, 2019) investigated the antiviral activity of *Sambucus Formosana* Nakai (which is a traditional medicinal herb) against Human coronavirus (HCoV) NL63.

Chlorogenic Acids and Human Coronavirus NL63



The study explored the anti-HCoV-NL63 activity of *Sambucus Formosana* Nakai stem ethanol extract and some markers of its phenolic acid constituents, like caffeic acid, chlorogenic acid, coumaric acid, ferulic acid and gallic acid. The study indicated the inhibitory activity of *Sambucus Formosana* Nakai extract and its phenolic acid constituents on HCoV-NL63 induced cytopathic effect, virus yield, and the early stage of HCoV-NL63 replication in concentration-dependent and cell-type independent manners.

<https://doi.org/10.1016/j.virusres.2019.197767>



THANK YOU
FOR YOUR
ATTENTION