

Carbonated Green Tea Infused with Spices and Fruit as An Alternative to Sugary Carbonated Drinks.

[1]Shweta Girme*, [2] Jayanti Gogawale, [3]Samikaha ghadge

[1],[2],[3] MIT College of Food Technology, Pune

[1]Shwetagirme3011@gmail.com*

Abstract— Consumption of carbonated sugary drinks which also contains caffeine is increasing extremely worldwide. Despite the drinks have been known for their adverse health effects still they are famous, especially among young population. Reinventing the carbonated beverages to its healthy alternative with ingredients rich in nutraceutical properties is necessary. Our study aims to discuss the healthier alternative to the sugar sweetened beverage containing green tea as a major ingredient. Tea being the 2nd most consumed beverage in the world after water. This is the reason why tea is very popular worldwide. So our study invents one of the type of tea i.e. green tea in new form with added nutrients like vitamin C, anti-oxidants, EGCG and many more polyphenols which will provide a healthy and tasty option for the available carbonated beverages. It is sweetened with honey which makes it suitable for people who wants to be calorie-deficit like obese and diabetic people. It is also beneficial for these people as it contains EGCG which have anti-diabetic and anti-obesity properties.

Index Terms— carbonated beverage, catechin, green tea, EGCG.

I. INTRODUCTION

Green tea is prepared from camellia sinensis leaves and buds which have not undergone the withering and oxidation process. Originated in China the green tea is produced and manufactured in many countries in Asia. Green tea is superior to black tea in the health benefits department. The major components i.e. polyphenols in green tea responsible for the antioxidant and other health benefits are the flavonoids. The major flavonoids in the green tea are the catechins, epicatechin (EC), epigallocatechin (EGC), and epicatechin gallate (ECG), epigallocatechin gallate (EGC). Epigallocatechin gallate is considered the most important active component.(Sinija & Mishra, 2008) The most pertinent flavonoids are the catechins, which make up 80%–90% of the flavonoids, and approximately 40% of the water-soluble solids in green tea.

According to the National Cancer Institute, the polyphenols in tea have been shown to decrease tumor growth in laboratory and animal studies and may protect against damage caused by ultraviolet UVB radiation. In countries where green tea consumption is high, cancer rates tend to be lower, but it is impossible to know for sure whether it is the green tea that prevents cancer in these particular populations or other lifestyle factors. Research has concluded that green tea consumption is associated with reduced mortality, including cardiovascular diseases. The catechins in the green tea are beneficial in preventing and protecting against diseases caused by oxidative stress.(Bernatoniene & Kopustinskiene, 2018) It's been proved that the carcinogens could be inhibited by catechins and the tumor growth and cancer cell invasion can also be suppressed. Consuming a green tea beverage daily seems to be significant for most health benefits and most importantly losing weight.(Ikbal et al., 2020)

Carbonated beverages also known as soda is consumed all

over the world for the fizz and the flavor and its association with the convenient lifestyle. The fizz and the unique flavor provide a refreshing taste which is popular among all generations. But the question is are those as healthy as the popularity? Definitely not, while these fizzy drinks may have their uplifting and thirst-quenching satisfaction, they correspondingly play a role in hampering and impacting the normal physiological functioning of the brain. The main component in carbonated-soft drinks is caffeine which triggers the excitation of the reticular system within the brain.(Anjum et al., 2018) Excess excitation of the system leads to insomnia, psychomotor agitation and headaches. Those drinks contain so much sugar and blood sugar and pressure spikes to the highest level. Those sugary drinks lead to weight gain, heart diseases, type II diabetes and even cancer.(Satish, 2018) Everyday consumption of sugary carbonated beverages increases the risk of metabolic syndrome and impaired sugar levels. According to the World Health Organization (WHO) Guideline 2015 on the intake of free sugars, a single can of sugar-sweetened soda contains about the upper limit of the recommended 25–50 grams per day. With the current health scenario of the world it is necessary to develop food and beverages having health benefits and sustainability.

Reinventing the current popular carbonated beverages with healthy ingredients and sugar free alternatives will not only reduce health hazards but also provide nutraceutical properties. The carbonated green tea infused with fruits and spices is a power packed and refreshing beverage. Carbonated green tea has benefits for digestion. It may improve swallowing, increase feelings of fullness and reduce constipation. There are various alternatives for cola and Pepsi present out there and the most common are sparkling water, fruit juice, infused drinks and green tea. These substitutes are not only mentioned all over the world as alternatives, but they have their individual health benefits.

Considering all the alternatives out there, consuming a carbonated green tea infused with fruits and spices would definitely make an insightful beverage and a competing

alternative to cola, Pepsi or any other sugary beverage.

The infusion of cinnamon and mint provides extra flavor and health benefits to the drink. Cinnamon has a very mystic flavor and aroma and it's a key ingredient in many beverages. Many researchers have discovered the significant benefits of cinnamon in Parkinson's disease and diabetes and its beneficial effect as an antioxidant, anti-inflammatory, and antilipemic, antidiabetic, antimicrobial, and anticancer. Cinnamon seems to be the promising ingredient and a major flavoring agent. The cinnamaldehyde component of cinnamon is responsible for its antimicrobial activity. It can inhibit the growth of *Listeria* and *Escherichia coli* in food products which leads to prolongation of their shelf life. (Kawatra & Rajagopalan, 2015)

The mint and orange juice on the other hand gives amazing and refreshing flavor with other health benefits. The flavor empowers the green tea's bitter flavor profile which makes the carbonated green tea drink palatable and tasty. The perfect balance of all flavors and the nutritional profile makes it a sustainable replacement for the carbonated sugary drinks. Orange is a citrus fruit having pleasant taste and rich in phytochemicals that can protect health. It is a good source of vitamin C along with folic acid, potassium and pectin. Phenolic content, flavonoids and antioxidant properties of citrus has been reported for their biological properties which can prevent various diseases

II. PREPARATION OF CARBONATED GREEN TEA INFUSED WITH SPICES.

Preparation of carbonated beverage involves various stages, first is preparing the green tea concentrate and then mixing the ingredients as per formulation. Preparing the final product requires good manufacturing practices and utilization of proper preservation principles to prolong the shelf life.

III. INGREDIENTS USED WITH THEIR HEALTH BENEFITS

1) Green tea leaves-

Green tea leaves contains a good quality and quantity of anti-oxidants which protects the body from oxidants and free radicals. Green tea leaves also contains polyphenols like catechin, ECG, ECGC, EC etc. which are very beneficial for body. For example catechin prevents the cell damage. Polyphenols present in green tea are having anti-diabetic and anti-obesity properties. (Cabrera et al., 2006) The green tea leaves are rich in various phytochemical substances like vitamin C, minerals like Mn, Cr, Se, and Zn. Loose leaves are used in the product as it contains more amount of bioactive compounds than the tea bags. (Ikbal et al., 2020)

2) Honey-

From ancient times honey is used as a sweetener in many sweet products. Honey has low glycemic index than regular sugar which makes it a good replacer of normal table sugar. It has more calories than sugar but it is also sweeter than sugar so required in less amount. It contains more vitamins and minerals such iron which is helpful to cure anemia. Due to favorable usage of honey, the drink suits the diabetic and obese people as well. It is also useful for people who are

always concern about their calorie intake.

3) Orange juice-

Orange belongs to the citrus family. It has characteristic tangy flavor which improves the taste of product. Also it is a rich source of vitamin C which is a water soluble vitamin. For addition of the orange juice have particular reasons like it will add nutrition, taste, flavor and consistency.

4) Mint-

Mint is one of the well-known medicinal plant. Botanical name is *Mentha Cassia*. It possess a refreshing and cooling flavor. It fights bad breath and also useful to reduce excess heat in the body. It is also helpful in digestion. It contains nutrients like iron, folate, manganese etc. It is low in calorie as well. Mint is used in the powdered form.

5) Cinnamon-

It is a well-known spice with sweet-spicy and woody flavor. Botanical name is *Cinnamomum cassia*. It is used for its flavor as well as its health benefits. It is used in powdered form so as to get more flavor extraction. It is rich in anti-oxidants. It is also useful for weight loss. It has anti-inflammatory properties. It is also good for gut health as it possesses prebiotic properties as well.

6) Water-

Water is life. Water provides a medium for all the ingredients. It is responsible for the consistency of the product. Mineral water is used in the product to avoid any kind of contamination.

7) Citric acid-

Citric acid acts as a preservative which expands the self-life of product and reduce the chance of deterioration. Citric acid is a natural flavoring agent. It is also helpful to maintain and regulate acidity. Citric acid is responsible for retaining the color of product.

IV. PREPARATION OF GREEN TEA CONCENTRATE

Measure tea leaves

Steep tea leaves in cold water for 5 min

Strain out tea leaves

The concentrate is ready

Refrigerate the concentrate in sealed container

Studies show steeping the tea leaves for a longer time can increase bitterness and change the colour of the concentrate

thus the concentrate is prepared with minimum steeping time and is further diluted with orange juice. Further the infusion with cinnamon and mint is done to add flavor to the tea and the studies say it is important to monitor infusion time for a better flavor profile of the final product.

V. PREPARATION OF CARBONATED GREEN TEA

Studies have indeed linked that the carbonation process may even enhance digestion by improving swallowing ability and reducing constipation. The consumer demand for better unhealthy beverage alternatives has been increased and providing a low calorie drink with health benefits will definitely add points.

The main reason to heat treatment is to make the carbonated green tea fit to consume and increase its shelf life.

Preservation techniques like pasteurization (LTST, HTST, and UHT) or sterilization are more common and generally used for all sorts of beverages.

Various non-thermal novel technologies can also be utilized to inactivate microorganism as researchers affirm that non thermal preservation is equally efficient as thermal preservation and has more benefits like retention of sensory and nutritional attributes. Techniques like high pressure processing, pulsed electric field, irradiation, and pulsed light, etc. are used as alternatives to conventional thermal processing to meet consumer demand.

The carbonation process is done after mixing of all the ingredients. When incorporating a carbonation effect, a CO₂ dosage line is added to the beverage production equipment. This inert gas is injected into a saturation vessel. It's these two pressurized containers that form the core of a carbonator. Preprocessing work is accommodated by a deaerator stage, a tank that removes oxygen, but it's the saturated gas effect that imparts the combination with effervescence. (cite url) The packaging can be similar to the coke drinks or taking a sustainable approach to recyclable bottles can be used. Lightweight packaging of any product reduces handling costs.



VI. BENEFITS OF CARBONATED GREEN TEA INFUSED WITH SPICES AND FRUIT.

Carbonation itself is a preservation technique and it also provides fizziness to the beverage. There are equal amount of nutrients present in the hot green tea and cold green tea. Temperature of serving and consuming does not affect the

nutritional content of the green tea. On the other hand, brewing at lower temperature for less time (3 to 5 minutes) will enhance the taste. As higher the temperature and longer time of brewing will create bitter taste. Cold water steeping increases the anti-oxidant capacity as well as the catechin content. Along with the steeping time the quality of tea is also responsible for the anti-oxidant content of the tea.

Cold water steeping reduces the caffeine content which is good for the people who are concern about their caffeine intake. A study published in magazine of commercially produced bottle tea found that the cold brewed varieties were higher in polyphenols. It is very good option for people who takes carbonated drinks after dinner; because unlike these drinks the carbonated green tea will not disturb their sleeping quality as it contains less caffeine. The sugary drinks also cause tooth decay but the carbonated green tea beverage will not.

VII. OVERCONSUMPTION OF GREEN TEA

Anything which is healthy does not allow having it beyond the limit. Excess consumption of both healthy and unhealthy product has their drawbacks. Having 3 to 5 cups of green tea a day is moderate but having it more than this may cause certain problems. Reasons why excess green tea can be harmful includes,- Caffeine content, Aluminum presence, effects of tea polyphenols on iron availability.(Sinija & Mishra, 2008). So, moderation is the key to consume anything and everything

CONCLUSION

Considering the current mortality rate, providing food and beverages with healthy options is necessary. Green tea is a good source of anti-oxidants which protects human body from oxidants and free radicals. The amino acid L-theanine present in tea is responsible for preventing caffeine rush and also provides energy for longer time. Manufacturing health alternatives to available products in the market would possibly attract a population with a busy lifestyle trying to stay healthy and it could also represent a convenient drink for all ages. The carbonated green tea not only provides an alternative product for the sugary carbonated drinks but also increases the value of traditional green tea.

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