Efficacy of Lemongrass into Coffee Powder for the Development of Cappuccino

Original Research
Article

Abstract

Lemongrass is a very popular herb now days due to its health promoting characteristics. It is a medicinal herb with antioxidant, anti-inflammatory and antibacterial properties. Consumption of lemongrass regularly can help to detoxify your body. It have cholesterol lowering properties and it improve digestion as well. Lemongrass can help in improving the mood and helps in reducing stress. Purpose of this study is to evaluate the effect of the addition of lemongrass powder to coffee powder on nutritional level and cappuccino has been made with this blend at different level to analyse sensory characteristics. Cappuccino is a worldwide popular drink with very high position in the market of coffee based beverages. Lemongrass was incorporated into the coffee powder at levels 0%, 5%, 10% and 15%. The proximate analysis was done for moisture, ash, crude fiber and fat. The DPPH (2,2-diphenyl-1-picrylhydrazyl) assay was used to evaluate the anti oxidant capacity of the blend and presence of phytochemicals also assessed using individual detection methods of each.The moisture content was 7.1%, ash content was 7.3% , crude fibre was 7.4% and fat was 0.927%. The phytochemicals like alkaloids, tannin, saponin, Terpenoid and flavonoid was found in the sample. DPPH radical scavenging for T3 was found to be 92.35±0.65%. T3(15%) sample has got the highest score in sensory evaluation when conducted by making cappuccino and also shown most enhancement in nutritional qualities as well. T3 sample was found the best composition for the lemongrass and coffee blend.

Introduction

The use of herbs in tea and coffee has become more and more common for a variety of reasons, including innovative flavor combinations and a growing interest in health and well being. This is a synopsis of the trend and the explanations for why it appeals to so many people: Consumers are becoming more conscious of their health and are searching for natural ways to improve their well-being. Herbal teas are widely promoted as having potential health benefits, such as providing antioxidants, boosting immunity, reducing stress, and aiding digestion. The majority of herbs that are added to tea and coffee are high in antioxidants, therefore adding herbs to tea or coffee will enhance its antioxidant profile.The beverage's flavor and scent are also enhanced by the addition of herbs. We'll also add anti-inflammatory herbs to the tea or coffee because many of them have them. Drinking herbal-infused beverages will also enhance metabolism and immunity (1).

Coffee drinks' composition was altered by the inclusion of other ingredients, which also significantly affected how specific nutrients were absorbed and released after digestion. Spices and fragrant herbs, with their strong antioxidant and antibacterial qualities, have gained a lot of attention recently as consumer demand for natural flavors has increased. The Graminae (Poaceae) family of plants, and in particular the lemongrass (Cymbopogon citratus), are relevant in this context. Lemongrass is one of the fragrant medicinal herbs that are growing in tropical and subtropical regions. The sour-flavored, aromatic stems and leaves of the lemongrass plant are why it is cultivated. Lemongrass essential oil has antidepressant,

antioxidant, antiseptic, anti-yeast, and antibacterial properties.Lemongrass essential oils have a wide range of applications in medicine and cosmetics due to their gastrointestinal problems, anti-inflammatory, antipyretic, and sedative properties.(2)

Lemongrass, also known as Cymbopogon Citratus, is a fragrant Poaceae family member. Given all of its advantages, lemongrass is a very flexible plant. The tall, clumpy perennial grass known as lemongrass can grow up to 2.5 meters in height. Its leaves are tall, glaucous, non-articulate, and narrow at both ends. They have a green, linear lamina. The plant can grow up to 50 cm in length and 1.5 cm in width (3)(4). Its population, which is located in subtropical and tropical locations, is made up of two separate species: Cymbopogan Citrates in the West Indies and Cymbopogan flexuosos in the East Indies. In addition, the wild populations of lemongrass are found in Australia, South East Asia, North America, Africa, South America, Brazil, Thailand, Bangladesh, and Malaysia (5).

Numerous conditions are treated with lemon grass leaf concentrate because of its diuretic, vasorelaxing, and soothing properties. People in developing nations use plant extracts to treat some ailments when pharmaceutical therapies are expensive (6). Lemon grass is commonly used to treat a number of vascular problems, headaches, hacking, and influenza. It has disengaged a variety of dynamic compounds from the C. citratus that occur naturally. The most important ingredient citral, which facilitates absorption and eases tense muscles, migraines, and periods of memory loss. This plant's oil possesses anti-fungal and antibacterial properties (7).Because lemon grass contains various chemical compounds that may cause a certain physiological activity in the human body, it offers a number of medicinal effects.The most important of these bio-active compounds include heart glycoside, alkaloids, saponins, flavonoids, tannins, and phlobatannins (8).
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The process of making coffee involves brewing Coffea shrub seeds till they become roasted. The coffee beans are extracted from the berries by processing and drying them once they have reached maturity. The two main species are Coffee Arabica, also known as coffee Arabica, and Coffee canephora, also known as coffee Rustica. They have been producing for a long time and are important to both the global market and research (9).

Coffee is frequently used for its stimulating qualities because of its rich phytochemistry, of which caffeine is the most notable component. The strongest form of caffeine is found in coffee; 240 milliliters of instant coffee provide about 100 milligrams of caffeine (10). Owing to the significance of this active alkaloid, Frary et al. (2005) surveyed caffeine intake from various sources and found that coffee accounts for 70% of total caffeine intake, while tea and soft drinks make for 16 and 12% of total caffeine intake, respectively (11).

Whether coffee is good or bad for human health is still up for debate. Its consumption has been linked to a significant reduction in chronic diseases such diabetes mellitus, Parkinson's disease, and several types of cancer (12). However, some investigations have provided information about its association with cardiac problems and certain types of cancer (13). Additionally, coffee seems to decrease the effectiveness of some heart-protective medications, such as atorvastatin (14) (15) (16). Although there are still notable differences that call for more research on the topic, coffee is definitely linked to enough health benefits to justify its serve at the table (17).

One of the most prevalent neurological conditions in the world is Parkinson's disease. Caffeine, one of coffee's main bio-active components, helps ward off Parkinson's disease. Although the precise mechanism is yet unknown, coffee is believed to have an impact on Parkinson's disease through its effects on the adenosine A2 receptor. By blocking adenosine A2 receptors, caffeine functions as a central nervous system stimulant and adenosine receptor antagonist. Because it can block adenosine A2 receptors in dopamine-rich brain regions, caffeine has a neuroprotective impact on the brain. Additionally, in animal models of Parkinson's disease, coffee reduces MTP-induced neurotoxicity and possesses neuroprotective properties.Two to three cups of coffee a day may help prevent Parkinson's and Alzheimer's disease, per a review research (18).

The main objective of this study was to evaluate how the incorporation of lemongrass into coffee powder have improved the nutritional, antioxidant and phytochemical properties.The lemongrass has been added to the coffee powder at 0%, 5%, 10% and 15% of the coffee powder weight. After conducting sensory evaluation using a composite scale and with help of 40 different panel members we have selected the T3 (15%) as the most preferred choice as it gives perfect blend of tastes(19). We have conducted the sensory evaluation by making cappuccino with each of these samples . The sample with no content of lemongrass at all was taken as reference sample.

Materials and Methods

2.1 Materials

The present study was carried out at the School of Home Science, Department of Food and Nutrition, Babasaheb Bhimrao Ambedkar University, Lucknow 226025, Uttar Pradesh. "Efficacy of Lemongrass into Coffee Powder for the Development of Cappuccino" was the main topic of the study. Coffee powder was purchased from the neighborhood market for this investigation, and lemongrass was gathered from Babasaheb Bhimrao Ambedkar University's dorm garden in Lucknow.

2.2 Preparation of the product

Collection of lemongrass leaves and coffee powder
     Lemongrass leaves are collected from the hostel garden of Babasaheb Bhimrao Ambedkar University, Lucknow and the Nescafe classic coffee powder has been bought from local mart near the university.

Dehydration of lemongrass leaves to make powder
     Lemongrass leaves collected from the Hostel, BBAU, Lucknow ,was placed in the dehydrator to dry the leaves. These leaves were dried to make the lemongrass powder that will be blended with coffee powder in different ratios. Dehydration of lemongrass leaves was done in Dehydrator at a temperature of 38-43°C for 4-6 hours. These dehydrated lemongrass was then manually ground using a mortar to get the lemongrass powder .Sieving is done using a sieve to get more refined powder.

Blending of lemongrass powder and coffee powder in different ratios.
     Dried lemongrass leaves powder was added at the levels of 0%, 5.0%, 10% and 15% of coffee powder weight, respectively. The coffee and lemongrass powders were carefully mixed.

Development of cappuccino using these blends of different ratios.
     Cappuccino has been made with all the samples of blends developed that is 0%, 5%, 10% and 15%. The 0% or the one with only coffee powder was taken as reference sample.

2.3 Sensory evaluation

The lemongrass has been added to the coffee powder at 0%, 5%, 10% and 15% of the coffee powder weight. After conducting sensory evaluation using a composite scale and with help of 40 different panel members we have selected the T3 (15%) as the most preferred choice as it gives perfect blend of tastes(19). We have conducted the sensory evaluation by making cappuccino with each of these samples . The sample with no content of lemongrass at all was taken as reference sample.

2.3 Proximate analysis

2.3.1 Moisture

Using the oven drying process, the AOAC method determined the sample's moisture content (AOAC 1990).

Moisture content % = $\dfrac{\text{Weight of wet sample } (M_w) - \text{Weight of dry sample } (M_d)}{\text{Weight of wet sample}(M_w)}$ × 100

2.3.2 Ash

The muffle furnace was used to ascertain the sample's total ash content (AOAC 1990). The steps used for this are as follows:

Ash content % = $\dfrac{\text{Weight of Ash (g)}}{\text{Weight of sample (g)}}$ × 100

2.3.3 Crude Fibre

The AOAC's sequential acid and alkali hydrolysis procedure was used to determine the crude dietary fiber content of the produced sample (AOAC 1990). 0.313M sodium hydroxide was the base, and 0.128M sulfuric acid was the acid. After being weighed, the 2g of material was boiled in 0.128M sulfuric acid for 30 minutes before being filtered. The filtrate was filtered following another 30-minute boil in a base solution of 0.313M sodium hydroxide. The filterate was ashed in a muffle furnace for five hours after being dried in an oven for two hours in order to measure its weight.The crude fiber % was then calculated using the following formula:

Crude fibre (%) = $\dfrac{W_1 - W_2}{W}$ × 100

Where,
W1 = Weight of the sample before ashing, (g)
W2 = Weight of the sample after ashing,(g)
W = Weight of the sample,(g)

2.3.4 Fat content

The Soxhlet extraction method for determining the crude fat content of food samples. A 2g samlpe that did not contain of moisture was stored in a thimble. After that, the sample-containing thimble holder was filled with 250 ml of diethyl ether. Next, the soxhlet apparatus was turned on, and it ran for 6 hours at a temperature of 34±20C. Subsequently, the extracted sample that was placed in the bottom flask was weighed (AOAC 1990).
The fat content was calculated by the following formula:

Crude fat % = $\dfrac{W4 - W3}{W2 - W1}$ × 100

Where,
W1 = Weight of empty thimble (g)
W2 = Weight of thimble + sample (g),
W3 = Weight of empty flask (g)
W4 = Weight of flask + fat (g)

2.4 DPPH Assay

Following the methodology outlined by Ali et al. (2020), the extracts' radical scavenging activity (RSA) was assessed using the DPPH (2,2-diphenyl-1-picrylhydrazyl) technique. The following formula was used to measure and express the radical-scavenging activity as a percentage of inhibition:

% Radical scavenging activity = [(Abs control - Abs sample / Abs control)]$\times$ 100
Where,
Abs control is the absorbance of DPPH solution without tested sample.
Abs sample is the absorbance of DPPH solution with tested sample.

2.5 Phytochemicals

Prepared product was taken as sample. It was first dissolved in ethanol and distilled water separately for obtaining the extraction of it for further procedure. It was left for 3 min. to dissolve in the solvents and after that it was filtered through whatman filter paper, and the residue was discarded. The extract was used for the phytochemical tests, the filtrate was centrifuged at 5000 rpm for 15 min. The extract was stored at 4°C for further use (20)

2.5.1 Tannins test:

In a test, about 1 ml of extract was cooked in 20 ml of water, then filtered. After adding a few drops of 0.1% ferric chloride, a green or blue-black hue was seen, indicating the presence of tannin (20).

2.5.2 Alkaloid test:

Hager's Reagent Test- Take 2ml of filtrate, few drops of Hager's reagents was added in test tubes. Formation of yellow color precipitate indicates the presence of alkaloids (20).

2.5.3 Saponin test:

Take 5ml of sample into test tube and shake vigorously. Formation of foam indicates the presence of saponin.

2.5.4 Terpenoid test:

5 ml of each plant extract were extracted and put into separate test tubes along with 2 ml of chloroform. Next, a layer was carefully formed by gently adding 3ml of concentrated H_2SO_4. The interface developed a reddish-brown hue, indicating the presence of terpenoid (20).

2.5.5 Flavonoid :

Sample extract (2ml) was taken into test tube. Then addition of NaOH (2%) done. Then after, few drops of HCl poured in the test tube. Disappear of colour shows the presence of flavonoid (20).

2.6 Limitations of the study

Due to the unavailability of the HPLC apparatus in the university the quantification of the phytochemicals couldn't be done. Only the test for presence or absence was conducted.

Results and Discussions

3.1 Proximate analysis

Proximate analysis of the all the samples was analyzed. This includes moisture content, ash content, crude fibre, fat content and carbohydrates are analyzed and reported accordingly.The analysis has been done for the R(0%), T1(5%), T2(10%) and T3 (15%) .

Table 1 Proximate analysis of all samples

Parameters	R	T1	T2	T3
Moisture(%)	4	5.8	6.5	7.1
Ash(%)	4.4	6.1	6.6	7.3
Crude fiber(%)	2.5	4.2	5.8	7.4
Fat content(%)	1	0.980	0.953	0.927
Carbohydrate(%)	78.60	77.12	75.05	74.75
Energy(K cal)	371.400	363.700	352.377	347.023

Table 2 Proximate analysis of the preferred sample through sensory evaluation.

| S.No	Parameters	Unit (%/g)	Sample portion in 100g
1	Moisture	7.1%	7.1g
2	Ash	7.3%	7.3g
3	Crude fiber	7.4%	7.4g
4	Fat	0.927%	0.927g
5	Carbohydrate	74.17%	74.17g
6	Energy	347.023 K cal	347.023 K cal

3.2 DPPH Assay

All the samples that is R,T1,T2 and T3 which contains 0%,5%,10% and 15% respectively are used for this analysis.The antioxidant activity of all the samples are determined.

Table 3. DPPH antioxidant assay

S. No	Sample	DPPH radical scavenging (%)
1	R	67.76± 4.12
2	T1	80.95± 2.34
3	T2	85.83± 3.56
4	T3	92.35± 3.23

Graph 1 Plot of DPPH radical scavenging vs Lemongrass concentration.
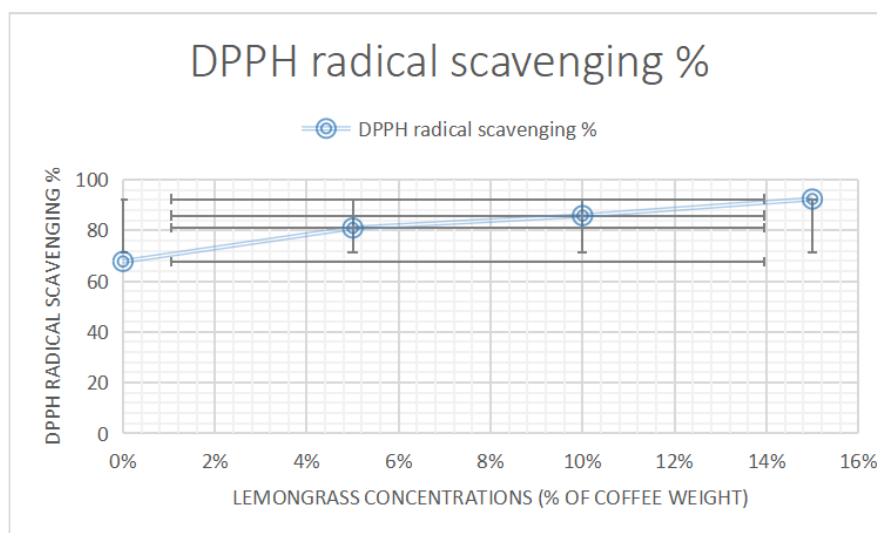
The graph has been plotted with radical scavenging % on Y axis and lemongrass concentration on the X axis. The standard deviations are also marked in the graph.

3.3 Phytochemicals.

The presence of various phytochemicals like tannins, saponin, flavonoid, terpenoids, alkaloids has been detected by conducting individual tests for each phytochemicals.

Table 4 Presence of phytochemicals in the blend

S.No	Test	Result
1.	Alkaloids	Positive
2.	Tannin	Positive
3.	Saponin	Positive
4.	Terpenoid	Positive

5.	Flavonoid	Positive

A. Tannin test

In this test, there is blue black colour formation happens that results positive or shows presence of tannin in the sample.

B. Alkaloid test-

Hager's reagent test was conducted and the formation of the yellow color precipitate indicated the presence of alkaloids.

C. Saponin test-

Formation of foam after the shaking the sample in the test tube indicated the presence of saponins.

D. Terpenoid test-

The terpenoid test was conducted and a reddish browm coloration of the interface was formed to show positive results.

E. Flavonoid test-

NaOH (2%) and a few drops of HCl was added to the sample extract.Disappearance of colour shows the presence of flavonoids.

3.4 Discussion

After conducting the proximate analysis we have found out the the moisture content , ash content, crude fiber, fat content etc…of the prefered blend of lemongrass and coffee (T3 with 15% lemongrass).The moisture content of prepared blend of coffee powder and lemongrass was found 7.1%. The ash content of developed blend was found 7.3%. The fat content of the blend was found 0.927%. The crude fiber content of the blend was found 7.4%. The carbohydrate content of the blend was found 74.17% and the total energy of the sample was found 347.023 K cal. The DPPH analysis of all the samples that is R,T1,T2 and T3 which contain 0%,5%,10% and 15% lemongrass respectively. The values found out to be 67.76± 4.12 80.95± 2.34, 85.83± 3.56 and 92.35± 3.23 respectively. As we can see the value is increasing with increase in the amount of lemongrass %. Qualitative tests for phytochemicals like tannin, alkaloids, terpenoids, flavonoids and saponins has been conducted. It has been found that all of them have given positive results for their tests. From these results what we can see was that with the increase in the percentage of lemongrass the antioxidant value also improves and other nutritional properties are also improved significantly.

Conclusion

After conducting sensory evaluation we have selected T3 as the most preferred sample with 15% lemongrass (19).After conducting nutritional analysis, results shows the improvement in the health

properties due to lemongrass addition. The DPPH analysis also shows with increase in the amount of lemongrass the antioxidant value also increases .T3 has highest anti oxidant activity.

In conclusion, the development of coffee-lemongrass blend presents an innovative approach in an already growing field of herbal infusion into our day to day beverages. The development of such a product will give the consumer an option to improve health condition without compromising the flavour.

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