A Comparative Analysis of *Camellia Sinensis* (Tea) and *Psidium Guajava* (Guava Tea) - An Alternative for Highly Caffeinated Tea

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***Abstract*: After water, most people in the world drink tea. The tea made from guava leaves is rich in antioxidants. The quality parameters that are tested in *C.sinensis* tea include TF (Theaflavins) – 1.15, TR (Thearubigin) – 10.54, HPS (High Polymerized Substances) – 3.77 and TLC (Total Liquor Colour) – 3.75. In the sensory evaluation of *C.sinensis* tea the colour, taste, odour and flavours are tested. The quantitative phytochemical analysis of *C.sinensis* tea contains Polyphenol – 22.93, Catechins – 15.37, Amino acids – 1.55 and Caffeine – 2.3. The GC-MS (Gas Chromatography and Mass Spectrometry) analysis of *C.sinensis* tea contains 7 compounds and the major compound is 2,4 cyclohexadiene. *P.guajava* tea tested for various quality parameters such as TF – 0.56, TR – 15.77, HOS – 13.27 and TLC – 4.82. According to the sensory evaluation, the colour, taste, odour and flavours of *P.guajava* tea gives more health benefits than *C.sinensis* tea. *P.guajava* tea has low green leaf parameters that include Polyphenol – 16.06, Catechins – 4.88, Amino acids – 0.53, Caffeine – 0.04 as compared to *C.sinensis* tea. GC-MS (Gas Chromatography and Mass Spectrometry) analysis of *P.guajava* tea contains 10 compounds and the major compound is 1,2 Bis(trimethylsilyl) benzene. The combination of *C.sinensis* tea and *P.guajava* tea contains 12 compounds and the major compound is 1,2 Benzisothiazol-3-amine tbdms. In this study, I recognize the *P.guajava* tea has more good health benefits compared to *C.sinensis* tea.**

***Keywords: Camellia Sinensis* tea powder and *Psidium Guajava* tea powder, TFTR analysis, Sensory Evaluation, Phytochemical analysis and GC-MS analysis**

I. INTRODUCTION

Tea consumption in the world accounts for about 4.9 billion kilograms in 2012, 6.6 billion kilograms in 2021 and is estimated to reach 7.4 billion kilograms in 2025. The first commercial tea plantation cultivation was established in 1823 during British rule when Scotsman Robert Bruce discovered the native variety of plant, *Camellia sinensis* at Assam. Tea plants are grown in subtropical and tropical climates. The major tea producing states in India are Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Karnataka, Kerala, Manipur, Meghalaya, Mizoram, Orissa, Sikkim, Tamil Nadu, Tripura and West Bengal. China and India contribute greater than 60% of the global tea production. *Camellia sinensis* plant is native to China and India, which constitutes White Tea, Green Tea, Oolong Tea, Black Tea and Pu-erh Tea [2].

India's tea production is above 22% of global. India consumes over 70% of its tea production. Tea has a compound called polyphenol that offers many health benefits. It stimulates the human brain primarily due to its caffeine content. Consumption of black tea can protect us from oxidative damage induced by subsequent degenerative diseases and cigarette smoke. Black tea's antioxidant properties reduce blood pressure, cardiovascular risk, skin cancer, liver cancer, breast cancer, stomach ulceration, cholesterol levels, Oral Bacterial growth, Dental cavities, repair endothelium, improving mental alertness, improve information processing skills [5]. Black tea contains a negligible number of calories, fats, protein and sodium. Tea regulates fluid balance in our body that is vital for mental and physical health. Tea consumption can detoxify the body, stimulate alertness, reduce joint pain, improve urine secretion, improve blood flow and immune system. In the fermentation process, the polyphenol and polymeric polyphenols oxidizes catechins. Tea can reduce the risk of diseases and promote healthy effects in metabolic disorders through many actions such as reducing lipid absorption and accumulation. Although tea possesses various health benefits, it also has some side effects such as anxiety, difficulty in sleeping, faster breathing, headache, increased urination, irregular heartbeat, nervousness, restlessness, ringing in the ears, tremors, Fetal Leukemia Risk, Colorectal cancer risk of Osteomalacia, Alzheimer disease, Parkinson disease, Palpitation, Diarrhea, Epigastric and Tachycardia [4]. There are 150 species of small trees and shrubs in the genus of *Psidium*. In those species, only 20 species produce edible fruits, the rest produces un edible fruits. The most cultivated species of *Psidium* is *Psidium guajava* L. that is common guava [9]. It improves the diet of millions of peoples.

The guava is a phytotherapy plant used in traditional medicine for its constituents of rich natural antioxidants that can be treated for malaria, gastroenteritis, vomiting, dysentery, wounds, ulcers, toothache, coughs, sore throat, inflamed gums, dengue virus infection, lower blood pressure, cholesterol, hair problems and male fertility [7]. The bioactive components in the guava leaf fight against pathogens, regulate blood glucose levels and even aid in weight loss. The guava leaves essential oil is rich in Cellulose, chlorophyll, cineol, eugenol, fat, flavonoids, malicious acid, mineral salts, resin, tannins, triterpenes, and fixed substances. It has a high content of Protocatechuic acid, quercetin, ferulic acid, ascorbic acid, gallic acid and caffeic acid found in this plant [9]. Guava leaves rich in Potassium, Fiber and Vitamin C. Guava leaves tea drink contains antioxidants, anti-inflammatory agents and antibacterial activity. It prevents toothache, mouth ulcers and gum inflammation. Phytochemicals are important in medicinal drugs and can be found in most valuable medical drugs. In recent years Gas Chromatography-Mass Spectrum (GC-MS) has been increasingly used in the study of essential oil, alcohols, acids, esters, alkaloids, flavonoids, steroids, amino and nitro compounds [18].

Therefor the present study was attempt on the following objectives,

- To prepare tea powder from both *Camellia Sinensis* and *Psidium Guajava* by CTC and fermentation process
- To compare the phytochemicals present in both *Camellia Sinensis* and *Psidium Guajava* leaves tea powders
- To compare the caffeine content and sensory evaluation of both tea powders
- To recommend the low caffeine content tea powder instead of caffeinated regular tea powder

II. Materials and Methods

1. Source of Plant Materials

The source of plants materials *Camelia sinensis* and *Psidium guajava* leaves were collected in the month of June 2019 at UPASI Tea Research Institution, Valparai, Tamil Nadu. The Tender leaves were selected and collected without any disease or pest attack.

2. Identification of Plant Materials

The collected plants were identified by a Botanist DR. Victor J Illango, Director I/C, Department of Botany, UPASI Tea Research Institution Valparai, Tamil Nadu.

3. Preparation of extract

The collected leaves of *Camelia sinensis* and *Psidium guajava* were cleaned by using tissue paper to remove the dust. The leaves were dried at room temperature per day. Further the leaves are grinded in Curl Tear Crush (CTC) in which the leaves passed through a series of cylindrical rollers proceeded with fermentation process for one hour (Fig 1).

4. Quantitative determination of the Phytochemicals

4.a. Estimation of Polyphenols in Green Tea Shoot

Take 1.0 g of fresh leaves in mortar and ground well with 10 ml of double distilled alcohol. Filter and collect the filtrates in 50 ml standard measuring flask. Repeat the process with further 20 ml portion of DD alcohol. The filtrate was made up to the mark with DD alcohol. Dilute 1 ml of the extract to 50 ml with distilled water and use for analysis. To 2 ml of diluted extract, 4 ml of the Folin - Ciocalteu reagent was added followed by 2 ml of 35% sodium carbonate solution. The Total volume was made up to 10 ml by adding 2 ml distilled water. Mixed the extract well for a minute and keep it undisturbed for 30 minutes. The absorbance was made at 700 nm using spectrophotometermeter[3].

4.b. Estimation of Catechines in Vanilin Reagent Method

Take 1.0 g of fresh leaves in mortar and ground well with 10 ml of doubled distilled alcohol. Filter and collect the filtrates in 50 ml standard measuring flask. Repeat the process with further 20 ml portion of DD alcohol. The filtrate was made up to the mark with DD alcohol. Dilute 1 ml of the extract to 50 ml with distilled water and use for further analysis. To 2 ml of the diluted extract 6.5 ml of ice cold vanillin reagent (kept under ice bath) was added slowly. The Total volume was made up to 10 ml by adding 1.5 ml distilled water. Mix the content for a minute and keep it for 15 minutes. The absorbance was made at 500 nm in the spectrophotometer[17].

4.c. Estimation of free Amino acids in Green Tea Shoots

Take 1.0 g of fresh leaves in mortar and ground well with 10 ml of double distilled alcohol. Filter and collect the filtrates in 50 ml standard measuring flask. Repeat the process with 20 ml portions of DD alcohol. The filtrate was made up to the mark with DD alcohol. Dilute 5 ml of the extract to 25 ml with distilled water and use for further analysis. To 1 ml of the extract add 1 ml of Ninhydrin reagent and make up the volume to 2 ml with distilled water in a test tube. Heat the test tubes in boiling water bath for 30 minutes. Add 5 ml of n propanol diluents and mix it well. The absorbance was made at 570 nm using spectrophotometer[9].

4.d. Estimation of Caffeine in Dry Leaf Sample

Few leaves were taken and finely grounded using pestle and mortar. 0.5g leaf bud sample, 2ml of Ammonia, 3ml of distilled water and 25 ml of Chloroform is added in separating flask and it is nicely shaken. Then allow the mixture for sedimentation and add 25ml of chloroform thrice. The supernatant solution should be transferred to another separating flask containing 1% of 10 ml potassium hydroxide. Again transfer the supernatant to another flask which contains sodium sulphate and filter it. Observe the moisture content and make up the volume to 100ml using chloroform. The standard solution is prepared from 0.5 ml of caffeine sample and made up to 10ml using chloroform. The absorbance was recorded using spectrophotometer at 272 nm[10].

4.e. Estimation of Theaflavin, Thearubigin, High polymerised substance and Total liquor colour by Spectrophotometer

Accurately weighted 2.0g black tea is taken in 250 ml conical flask. To which 100ml of boiling distilled water is added. The flask is kept in water centigrade for 10 minutes with intermittent swirling and the contents of the flask were filtered through glass wool and cooled. The filtrate was used for extraction of TF, TR, HPS, TLC using various solvents like IBMK, Butanol and Disodium hydrogen orthophosphate from black tea samples[12].

5. Sensory Evaluation

A group of 10 volunteers were selected as consumer panelist from family and friends. Panelist agreed to taste the samples and questions were asked about the tea consumption habits. The sensory properties of the dry *Camelia sinensis* leaf powder and dry *Psidium guajava* leaf powder were compared and evaluated. The beverages are prepared according to the above methodology and the samples were served hot to 10 members. The panelist evaluated the drink according to the colour, taste, odour, flavour and overall acceptability. A numerical basis of evaluation: 1 representing dislike extremely to 10 representing liked extremely were noted[8].

6. GC-MS Method

GC-MS analysis was carried out on a GC clarus 500 Perkin Elmer system comprising a AOC-20 I auto samples and gas chromatograph interfaced to a mass spectrometer instrument employing the following conditions are; column Elite-1 fused silica capillary column (30× 0.25 mm ID× 1 mew Mdf, composed of 100% Dimethyl polysiloxane), operating in electron impact mode at 70eV; Helium gas (99.999%) these used as carrier gas at a constant flow of 1 ml/min and an injection volume of 0.5 I was employed (split ratio of 10:1) injector temperature 250°C; ion source temperature 280°C. The oven temperature was programmed from 110°C (isothermal for 2 min), with an increase of 10°C/min, to 200°C, then 5°C/min to 280°C, ending with a 9 min isothermal at 280°C. Mass spectra was taken at 70eV; a scan interval of 0.5 seconds and fragments from 40 to 450 Da. Total GC running time is 36 min.

The relative percentage amount of each component was calculated by comparing its average peak area of the total areas. Software adopted to handle mass spectra and chromatograms was a Turbo Mass Ver 5.20.

6.a. Identification of Component

Interpretation is the mass spectrum and GC-MS analysis were conducted using the database of National Institute Standard and Technology (NIST) having more than 62,000 patterns. The spectrum of the unknown components was compared with the spectrum of unknown components stored in the NIST library. The name, molecular weight and structural components and the test materials were ascertained [16].

PLATE – I

PLATE - II

A – Habit of *Camelia sinensis* (UPASI-9)

B – Habit of *Psidium guajava* (Guava)

C -Tea powder obtained by Grinding

A – Drying Process of Guava Leaf

B – Withering Process of Guava Leaf

C – Curl Process

D – Tear Process

E – Crush Process

F – Fermentation Process

III. RESULTS

The *Camelia sinensis* is a special species in evergreen shrubs of small trees and the flowering plant of family Theaceae. The Guava leaves are light green, short stalked, coriaceous, alternate, lanceolate, serrate margin, glabrous or pubescent beneath, varying in length from 5 - 30 cm and about 4 cm on width. The mature leaves are bright, green colored, smooth and leathery while young leaves are pubescent. Flowers are white, fragrant, 2.5- 4 cm in diameter and it found in solitary or in clusters of two or four. Flowers bear numerous of stamens with yellow anther and produce brownish red capsules. Fruit is flattened, smooth, rounded, trigonous three celled capsule, seed solitary, size of a small nut (PLATE-I A).

The *Psidium guajava* belongs to the family Myrtaceae. The guava tree is an evergreen small tree. The guava leaves are 2 to 6 inches long and 1to 2 inches wide and aromatic. when crushed and appear dull green with stiff but coriaceous with the pronounced veins. Botanically the guava fruit is a berry. Guava fruits are various in sizes such as medium to large and average weight of 100-250 g and 5-10 cm in diameter, and have four or five protruding floral remnants (sepals) on the apex. Based on the cultivar, fruit can be many shapes such as spherical, ovoid or pyriform. Fruit surface is become rough to smooth and free of pubescence. The skin colour of immature and unripe fruits are mostly seen in dark green in colour and which changes to yellowish-green, pale yellow and yellow with red blush on shoulders at the ripe stage. It is depending upon the cultivar. When the pulp of ripe fruit is soft and juicy and also it is white, pink or salmon-red. The seed cavity from the centre of fruit may be small to large with many hard to semi-hard seeds (PLATE-II B).

Tea is mostly consumed second drink in the world. An estimated 80% of the world population enjoys a caffeinated product daily. Thearubigins give black tea its distinct red brown colour and stronger flavor. There are some common traits are used to describe the overall flavor and profile of the black tea category. On the black tea category, it mainly includes malty, smoky, brisk, earthy, spiced, nutty, metallic, citrus caramel, leather, fruity, sweet like honey. It has a stimulating effect in humans, primarily due to its caffeine content. *P.guajava* tea powder is prepared through following stages, namely cleaning, drying and grinding. Grinding is a suitable method for the production of tea powder (Plate -IIIC).

PLATE - III

A - Tea powder (UPASI-9, Guava)

B - Guava tea in leaf tea powder

C - Colour variation of normal tea and guava

D - TFTR analysis in the caffeine content

E - Caffeine content in tea powder

TFTR Analysis

The presence of caffeine in the three leaf samples were verified by using TFTR spectrophotometer analysis. TF contents was found be high in UPASI -9 (1.15ml/l) and the lowest value was obtained in combination of UPASI- 9+Guava in the ratio of 1:3 (0.40 ml/l). The estimation of TR and HPS shows the high content of (15.77ml/l) and (13.17ml/l) in guava respectively. The lower content of TR was observed in combination of Tea in ratio of 1:3 (10.11 ml/l), whereas in case of high polymerized substance (HPS) was the highest in Guava tea powder (13.15 ml/l). The highest value of TLC was obtained in *P. guajava* (4.82 ml/l) whereas the lowest content of TLC was obtained in Guava + UPASI - 9 1:1 ratio (0.48 ml/l). The caffeine content was found to be high in UPASI-9 (2.60ml/l) and lower in guava tea powder (0.60ml/l) Table-I.

Table I TFTR analysis of UPASI-9 and Guava in various ratio

S.no	Tea Powder	TF (ml/l)	TR (ml/l)	HPS (ml/l)	TLC (ml/l)	Caffeine (ml/l)
1	**UPASI-9**	1.15	10.54	8.53	3.75	2.60
2	**GUAVA**	0.56	15.77	13.17	4.82	0.60
3	**UPASI- 9+Guava (1:1)**	0.65	12.74	9.54	3.54	1.68
4	**UPASI-9 Guava (1:2)**	0.45	10.52	8.67	3.6	1.10
5	**UPASI-9+Guava (1:3)**	0.40	11.42	9.62	3.74	0.91
6	**Guava+UPASI-9 (1:2)**	0.62	10.65	8.64	3.55	1.30
7	**Guava+UPASI-9 (1:3)**	0.63	10.11	8.75	0.48	1.60

*TF – Theaflavin, *TR – Thearubigin, *HPS – High Polymerized substance, *TLC – Total Liquor Colour

Sensory Evaluation of Tea Powder

Sensory evaluation is conducted to determine the food quality characters like colour, taste, odour, flavour and the degree of compliance with consumer habits. The data collected indicates the highest score for sensory characters like colour, taste, odour and flavour in *C.sinensis* followed by *P.guajava*. *C.sinensis* + *P.guajava*. The evaluation reveals that colour quality was found to be high in *P.guajava* (8.7) when compared with *C.sinensis* and *C.sinensis* + *P.guajava*. The odour of both *P.guajava* and *C.sinensis* + *P.guajava* was found to be higher (9) than *C.sinensis*, but the flavour was found to superior in *C. sinensis* tea powder. The overall acceptability was found to be high in *C.sinensis*. However *P.guajava* tea powder has acceptability of 8.65 out of 10 which also consider as a better choice for most of volunteers consumed Table-II.

Table II Sensory Evaluation of various tea powders prepared from *Camelia Sinensis* and *P.guajava*

S.no	Tea Powder	Colour (10)	Taste (10)	Odour (10)	Flavour (10)	Over all Acceptability (10)
1	***C.Sinensis***	8.5	9	8.7	9.5	8.9
2	***P.Guajava***	8.7	8.9	9	8	8.65
3	***C.Sinensis+ P.Guajava* (1:2)**	8.2	8	9	8	8.3

Quantitative Phytochemical Analysis

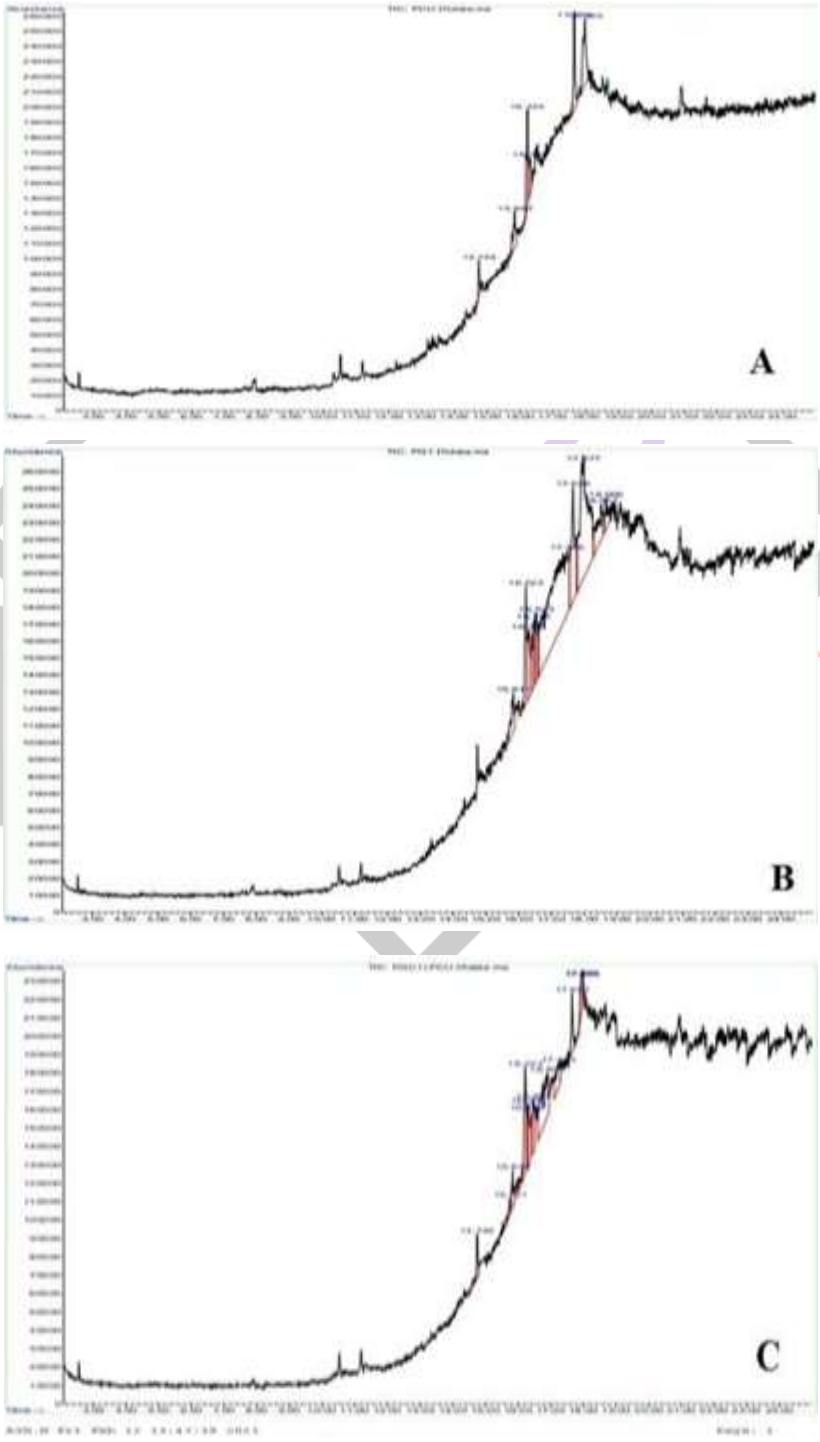
The phytochemical analysis of ethanolic extract of *Camelia sinensis* and *Psidium guajava* leaf powder is represented in the Table -III which shows the presence of bioactive components like polyphenols contents high in UPASI-9 (22.93ml/l) and lower in Guava (4.18). The highest catechins content high in UPASI-9 (15.37ml/l) and lower in Guava (1.5). The highest value of amino acid in

UPASI-9 (1.55ml/l) and lower in Guava (0.35ml/l). The caffeine content was found to be high in UPAS-9 (2.3) and lower in Guava (0.4). The bioactive content is higher in UPASI- 9 followed by the combination of *C.sinensis* + *P.guajava*(1.2) TableIII.

Table III Quantitative analysis of UPASI-9 and Guava tea powder

S.no	Tea Powder	Polyphenol (ml/l)	Catechins (ml/l)	Amino Acids (ml/l)	Caffeine (ml/l)
1	**UPASI-9**	8.5	9	8.7	9.5
2	**GUAVA**	8.7	8.9	9	8
3	***C.Sinensis*+ *P.Guajava* (1:2)**	8.2	8	9	8

PLATE – IV



GC-MS Analysis of UPASI-9 Tea Powder

About seven compounds were identified in *C.sinensis* leaves tea powder of by using GC-MS analysis. The active principles with their retention time (RT), molecular formula, molecular weight (MW) and concentration (%) are presented in Table-IV. The GC-MS analysis confirms that the ethanol extract of *C.sinensis* contains 7 compounds such as 1H-Indole, 5-methyl-2-phenyl, 2-Methyl-phenylindole, Octasiloxane,1,1,3,3,5,5,7,7,9, Hexahydropyridine 1-methyl1-4-[4.,], 1,2-Benziasothiazol-3-amine tbdms,1,2-Bis (trimethylsilyl) benzene and 2,4-cyclohexadien-1-one,3,5-bis.

Table IV GC-MS analysis of *C.sinensis* leaf tea powder

Peak	R.Time	Area %	Name	Molecular Formula	Molecular Weight
1	14.748	3.76	1H-Indole,5-methyl-2-phenyl	C15H13N	207
2	15.844	12.74	Octasiloxane,1,1,3,3,5,5,7,7,9	C16H48O7Si8	577
3	16.223	22.85	Hexahydropyridine	C13H19NO2	221
4	16.308	10.02	5-Methyl-2-trimethylsilyloxy-ace	C7H14O	207
5	17.650	20.75	1,2-Benzisothiazol-3-amine tbdms	C7H6N2S	264
6	17.653	23.85	1,2-Bis(trimethylsilyl)benzene	C12H22Si2	224
7	17.981	29.88	2,4-Cyclohexadien-1-one	C14H21NO	236

GC-MS Analysis of *P.guajava* Tea Powder

About ten compounds were identified in tea powder prepared from *P.guajava* leaves by using GC-MS analysis. The active principles with their retention time (RT), molecular formula, molecular weight (MW) and concentration (%) are presented in Table-V. The GC-MS analysis confirms that ethanol extract of *P.guajava* contain 10 compounds such as Octasiloxane,1,1,3,3,5,5,7,7,9, 2-Ethylacridine, Hexahydropyridine , 1,2-Benzisothiazol-3-amine tbdms, 1,2-Bis(trimethylsilyl) benzene, 2,4-cyclohexadien-1-one,3,5-bis, Benz[h] quinolone, 2,4-dimethyl, Anthracene,9,10-dihydro-9,10 and 1,2, 5-Oxadiazol-3-amine

Table V GC-MS analysis of *Psidium Guajava* leaf tea powder

Peak	R.Time	Area %	Name	Molecular Formula	Molecular Weight
1	15.844	3.50	Octasiloxane,1,1,3,3,5,5,7,7,9	$C_{16}H_{48}O_7S_{18}$	577
2	16.223	5.13	2-Ethylacridine	$C_{15}H_{13}N$	207
3	16.317	4.73	2-(Acetoxymethyl)-3-(methoxycarb)	$C_9H_{10}O_5$	214
4	16.468	3.98	2,4-Cyclohexadien-1-one	$C_{14}H_{21}NO$	236
5	16.535	3.74	Benz[h] quinolone, 2,4-dimethyl	$C_{12}H_{13}N$	207
6	17.490	36.94	1,2, 5-Oxadiazol-3-amine	$C_3H_5N_{30}$	280
7	17.660	10.26	1,2-Benzisothiazol-3-amine tbdms	$C_7H_6N_2S$	264
8	17.981	24.44	1,2-Bis(trimethylsilyl)benzene	$C_{12}H_{22}Si_2$	224
9	18.520	5.10	1H-Indole,5-methyl-2-phenyl	$C_{15}H_{13}N$	207
10	18.662	2.17	Anthracene,9,10-dihydro	$C_{14}H_{12}$	180

GC-MS Analysis of Combination of *C.sinensis* and *P.guajava* Tea Powder

Twelve compounds were identified in combination of (*C.sinensis* and *P.guajava)* tea powder prepared from ethanol extract of *C.sinensis* + *P.guajava* by using GC-MS analysis. The active principles with their retention time (RT), molecular formula, molecular weight (MW) and concentration (%) were presented in Table VI. The GC-MS analysis confirms that 12 compounds such as Octasiloxane 1,1,3,3,5,5,7,7,9, Vanadium (. etc.7-cycloheptatrie), N-Methyl-1-adamantaneacetamide, 2-Methyl-7-phenylindole, 1,2,4-Benzenetricarboxylic acid, 2-Ethylacridine, 1,4-Bis(trimethylsilyl)benzene, Pyrrolidine, 1-1-oxo-9-octadecy and 1,2-Benzisothiazol-3-amine tbdms. 3-Quinolinecarboxylic acid

Table VI GC-MS analysis of *C.sinensis and P.sidium Guajava* tea powder

Peak	R.Time	Area %	Name	Molecular Formula	Molecular Weight
1	14.748	6.00	Octasiloxane,1,1,3,3,5,5,7,7,9	$C_{16}H_{48}O_7Si_8$	577
2	15.759	1.57	2,4-Cyclohexadien-1-one	$C_{14}H_{21}NO$	236
3	15.844	5.27	2-Ethylacridine	$C_{15}H_{13}N$	207
4	16.223	17.26	Vanadium (. eta.7-cycloheptatrie)	$C_{10}H_{10}V$	207
5	16.270	3.60	Cyclotrisiloxane hexamethyl	$C_6H_8O_3Si_3$	222
6	16.317	9.27	3-Quinolinecarboxylic acid, 6,8	$C_{16}H_{48}O_7Si_8$	577
7	16.468	8.27	N-Methyl-1-adamantaneacetamide	$C_9H_6O_6$	210
8	16.991	8.27	2-Methyl-7-phenylindole	$C_{14}H_{11}N$	207
9	16.903	24.86	1,2,4-Benzenetricarboxylic acid	$C_3H_6N_2O_3$	118
10	17.234	8.24	1,4-Bis(trimethylsilyl)benzene	$C_{12}H_{22}O_2Si_2$	222
11	17.650	7.44	Pyrrolidine ,1-(1-oxo-9-octadecy)	$C_{22}H_{41}NO$	335
12	17.984	5.94	1,2-Benzisothiazol-3-amine tbdms	$C_7H_6N_2S$	264

IV. DISCUSSION

Tea is a widespread drink with stimulating and it have many functional properties. Native place of tea (*C.sinensis)* is in Southern regions of China and parts of India, Laos, Thailand, Vietnam, and Myanmar. Tea is said to be first drink and medicine in China around 2737 BC. It was introduced in to Japan during the early 13th century and to Europe in the 16th century, then to America, Africa and other regions of the world. It is cultivated in over 30 countries around the world [13]. When compared to water, tea beverages are secondary in terms of worldwide consumption. It grows mostly in the tropical and subtropical areas with adequate rainfall, good drainage and slightly acidic soil. Although tea possess various side effects such as reduced iron absorption, nausea, heart burn, pregnancy complications, dizziness, shortness of breath, irritability, feeling of weakness, colorectal cancer risk, ovarian cancer, etc. [15].

Theaflavins (TF) and thearubigins (TR) are the most important chemical compounds. It contributes the colour, brightness, strength, flavor and briskness of tea liquor. The extent of theaflavins (TF) and thearubigins (TR) during manufacture determines the chemical quality of tea and apart from the cluster of volatile flavour compounds. No single compound can contribute to the entire quality of made tea [24]. The major quality parameters such as TF, TR, HPS and TLC, apart from the cluster of volatile flavor compounds. TR showed a negative correlation with made tea [19]. TF (1.15ml/l) was found to be high in UPASI-9 while TR content was found to be high in Guava (15.77ml/l). Similarly, results were obtained in the clone of tea plant *Tinali* (A- b) *Chiniya* (C-b) has the highest content of TFTR respectively. Also, optimum fermentation process can also be detected by the values of TFTR. The value of TF, TR was sufficient for completing fermentation process of tea (T-b) [11]. The content of TR content was found to be high as compared to TF value (10 times) which implies that the prepared tea has best quality. Similar results were obtained in the present study for Guava tea powder (TF value - 0.56ml/l and TR value - 15.77ml/l). Also, tea powder prepared from the combination of UPASI-9 and Guava (1:3) has lowest for TF value (0.40ml/l) with high TR value (11.42ml/l) but it was inferior to the quality of guava tea. The brightness of the tea powder is highly related to the TF value whereas TR value is negatively related to the high quality of tea. The values of TF and TR may change according to varieties of tea prepared, overall oxidation of catechins and cultivar of tea plant [14].

The result of high polymerized substance (HPS) of guava tea powder found to possess highest HPS value (13.17ml/l) and lowest value (8.53ml/l) in UPASI 9. The result of Total liquor colour (TLC) of guava tea powder was found to be highest with (4.82ml/l) which implies the extreme brightness of tea powders [13]. HPS are believed to be part of TR and responsible for the body, strength richness and colour of the tea liquor. TLC is directly correlation with TF, which emphasized that TLC is a part of TR. The caffeine content was found to be higher in UPASI- 9 tea variety (2.60ml/l) when compare to other tea combinations with guava. The lowest caffeine content was observed in tea prepared from guava leaf powder (0.60ml/l). Guava tea powder was effective and satisfies all the criteria for a good quality tea from various parameters such as TF, TR, HPS and TLC. Hence, two tea powders such as UPASI-9 and Guava (1:3) were prepared and Guava tea powder was found to be better choice to recommend and replace commercial caffeinated tea powder [20].

When sensory evaluation of tea it is a scientific discipline that uses the human senses (sight, smell, taste, touch and hearing) to evaluate and understand the physical, attributes of consumer products. These methods can improve the design product profiles, determine sensory preference drivers, uncover consumer taste segments and optimize product to concept fit. Sensory analysis is relevant to food and drink, personal care, home care, and many other sectors [1]. In the study sensory evaluation revealed overall acceptability is higher for *C.sinensis* (8.9) and followed by *P.guajava* (8.65) and lesser in both tea powders(8.3). The Count for infused leaf of *Gumti* (G-g) (8.33) is higher than others but not appreciably different. considering all these sensory parameters, the total quality score for *Gumti* (G-g) was expressively superior to others. The overall acceptability of tea is combinations of all parameters of orthodox black tea from different clones are presented, dry tea appearance ranged from 7.9 in *Tinali* (T-b) to 8.3 in *Chiniya*(C-g) [21].

Polyphenol is one of the phytochemicals and it contains large bioactive structural phenolic units. It has a wide range of classification and possess various pharmacological and health promoting effects. In the study polyphenol content high in UPASI-9

(22.93ml/l) and found to be lower in guava (4.18ml/l). Prolonged usage of polyphenol results in various side effects such as kidney damage, tumors and imbalance in thyroid hormone levels. It is also probable that the increase in TF could be due to the increase in polyphenols at the optimum ratio, which is the precursor of TF and TR. Catechins found in tea that helps protect cells from damage caused by free radicals. Free radicals are unstable molecules that are made during normal cell metabolism [19]. In the study catechin high in UPASI-9 (15.37) and lower in Guava (1.5). Catechin accumulation in the body some side effects such as head ache, vomiting, irregular heartbeat, heart burn, dizziness, ringing in the ears, sleep problems, irritability and reduce the absorption of iron from food. Amino acids are the main contributors to tea flavor and function. In the study catechin high in UPASI-9 (15.37ml/l) and lower in guava (1.5ml/l). Amino acids contain called L- theanine, which increases the production of alpha waves in the brain. L-theanine, combination with caffeine, improves brain function. The polyphenol, catechin and amino acid content in Guava is lesser so it can be used as an alternative tea and we can reduce the side effects caused by these chemical constituents.

In this study the GC-MS analysis of *C.sinensis*, *P.guajava* and combination of both tea powders were conducted. There were seven compounds present in *C.sinensis* but the major compound was 2,4-Cyclohexadien-1-one. However, GC-MS analysis of *C.sinensis* leaf powder showed the major compound as 1 H- Purine-2,6-dione ,3,7-dihydro-1,3,7-trimethyl with peak area (324399328) in GC-MS analysis [16]. In *P.guajava*, there were ten chemical components in which the major component were 1,2-Bis (trimethylsilyl) benzene, 1,2-Benzisothiazol-3-amine tbdms is the major chemical compound present combination tea powders *C.sinensis*+ *P.guajava* (1:2 ratio). All of these compounds possess antioxidant, antibacterial and antifungal property which enhance the body and mental health when consumed as tea liquor.

From the present study, we can able to conclude that guava tea powder was superior over normal tea. Additionally, guava tea has many medicinal properties to treat cough, pulmonary diseases, anti-inflammatory, haemostatic agent, diarrhea, malaria, dysentery, sore throats, menstrual complications, bleeding gum and bad breath. It is also rich in dietry fiber contents, vitamin-C with moderate levels of folic acid, carotenoids, polyphenols, gallocatechine, leucocyanidin and amritoside [22]. Hence, Guava tea can be used as a potential substitute for commercial caffeinated tea varieties with some health benefits for avoiding various diseases and elevated immune power in our body.

V. Conclusion

Tea is a popular beverage that is consumed all the world and believed that they are natural, safe and can promote health factors, but the chemical substance present in *C.sinensis* cause several side effects such as difficulty in sleeping, breathing faster, head ache, ringing in the ears, irregular heart beat etc. The caffeine content and chemical substance present in *C.sinensis* is comparatively higher than *P.guajava*. In *P.guajava*, the chemical constituent present are lesser in amount and doesn't cause any side effects when consumed raw or as tea. The guava leaves are rich in bioactive compounds which can be used in the treatment of diabetes, cardiovascular diseases, obesity, hair loss and antherosclerosis etc. Hence the study reveals the tea powder made from *P.guajava* leaf has health promoters that improve our overall health. So, it can be used as an alternative beverage

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