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Research Article

Medicinal and Therapeutic Potentialities of Black and Green Teas (*Camellia sinensis* L.) Grown and Processed *In-situ* at PARC-NTHRI

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A B S T R A C T

The present study was initiated to investigate whether there is a significant difference in quality between black and green teas. A total of two samples (Black tea and Green tea var: Qi-men) were selected. Tea leaves were first selected, then processed into Black and Green teas through various steps. Standard methods were carried out to analyze proximate composition of moisture content, ash content. Tea samples were evaluated and analyzed for chemical parameters i.e. polyphenols, Amino acids, steroids, terpenoids and crude fiber. This exercise was carried out for a period of 2 months. Extracts of different solvents were used i.e. Chloroform, Aqueous, n-hexane and ethanol. The results indicate that Flavonoids are present in all extracts. Saponins are found in all extracts except ethanol. Phenol, terpenoids, steroids and tannins are found in both aqueous and ethanolic extracts. Steriods, terpinoids and phenol are absent in n-hexane extract. Green tea has higher polyphenol content as compared to black tea in aqueous, chloroform and ethanol but in n-hexane extract black tea has higher polyphenols. Green tea has less amino acid content as compared to black tea.

Keywords: Black Tea, Green Tea, Phytochemical, Proximate Composition

Introduction

Tea is an infusion made of processed leaves or buds or twigs of a tea bush, in hot water for several minutes. Tea is one of the most consumed beverages of the world. Presently, it is cultivated in at least 30 countries around the world. Approximately 76-78% of tea produced is consumed in the form of Black Tea, 20-22% in form of green tea and less than 2% as oolong tea. Black Tea principally consumed in Europe north America and North Africa. While green tea in drink in China, Japan Korea and Morocco. Tea is made up of two essential elements: boiling water and tea leaves.It is the most popular beverage in the world and is seen as equally effective as tap water to quench thirst and more often than mineral water, fruit juices, soft drinks and coffee. The ability of tea to quench thirst is not, however, the main reason for its popularity as a beverage.

Tea has come to occupy an important place among plantation crops of the world and it is known world over as one of the healthy beverages. Tea plantation is wonderful agro-asset and does not cause any imbalance in the eco-system and it contributes a lot in maintaining ecological balance. The lush green tea plantation retains the soil cover, checks soil erosion and also conserves the soil moisture. Different tea clones and varieties have been grown at NTHRI, Shinkiari according to their capacity and habitats on the basis of their phenotypic characters. Morphological traits and characterization is the initial steps of classification and to identify characterization for any crop (Waheed et al., 2017). Tea is cultivated in 31 countries scattered from 45^0 North to 33^0S of equator. Because of the long history and a large scale production, trade and consumption, tea occupies an important place in the world agriculture economy. Tea production in the world increased staidly and reached 4.2 million tons in recent year. On an average, during the last two decade in the production closely followed by India (25%), Sri Lanka (9%) and Kenya (9%). Turkey (5.3%) is the 5^{th} biggest tea producer country. Today, Turkey holds a significant place among the world's largest tea producer. But still a great percentage of production has been marketing in domestic market.

Pakistan has a long tradition in tea drinking which has become an integral part of the social life. The quality and chemical composition of tea flush vary under varying climatic conditions. Minor climatic variation is known to cause significant changes in the chemical composition and hence quality of tea. Phenol shields plants from oxidative harm because it is a best antioxidant (Madiha et al., 2017). Furthermore, to increase the metabolic activity clinical trials suggest that, green tea speed up insulin sensitivity, enhance oxidation of fats and glucose tolerance (Venables et al., 2008). The Epidemiological study suggests the green and black tea to help in prevention of diabetes (Waheed et al., 2017). Black tea can lower the level of cortisol (stress hormone) after exhausting activity (Steptoe et al., 2007).

Degenerative diseases can be initiated by oxygen species and highly reactive free radicals. The fundamental normal for an antioxidant is its capacity to trap free radicals (Madiha et al., 2017).

Objectives

Keeping in view the therapeutic significance of Black tea and Green tea, the present study was developed with following aims and objectives.

- Collection and processing of Black and Green teas.
- Evaluation of the phytochemistry of Green and Black teas qualitatively and quantitatively.
- Physicochemical analysis of Green and Black teas.

Methods and Materials

Samples: Black tea and Green tea

Variety: Qi-men

Collection

Samples were collected for analysis from PARC-NTHRI in fine plastic packs appropriately named with the number and date of gathering of samples. Standard herbal methods were taken after for the accumulation of tea sample. Specimens of the tea sample were gathered. Before investigation, sample was assessed for any noticeable soil and creepy crawly parts.

Physiochemical Analysis

United States Pharmacopoeia-National Formulary method was adopted for studying physiochemical properties.

Determination of Moisture Contents

In tarred china dish, 2g of powdered plant was weighed. To dry the plant material china dish was kept in oven at 105°C for 30 minutes for drying. After expelling from oven, for cooling it was placed in desiccators. At the point the cooled china dish was measured or weighed and the weight of dried material was calculated by subtracting the empty china dish weight plus dried material weight (Thomas *et al*., 2008).

Phytochemical Analysis

Plant powder was analyzed for presence of various phytoconstituents. Flavanoids, Phenolic and Tannins was detected by method described by Harbone (2005). Saponins were determined by Kaur and Arora (2009) method. Different chemical tests were carried out using extracts via standard procedure described by Trease and Evans (1989).

Analysis of Different Constituents

Determination of Tannins

A part of the extract is dissolved in water and purified using filtration process and then the 10 % Ferric chloride solution was added to the filtrate. Presence of tannins is indicated by appearance of bluish color (Harbone, 1998).

Determination of Flavonoids

2.0ml of the extracts was dissolved in 2.0ml of dil NaOH. Presence of flavonoids is indicated by the appearance of a yellow colour (Harbone, 1998).

Determination of Saponins

1.0ml extract was mixed with 1.0ml distilled water and shaken forcefully. The presence of saponins is indicated by appearance of stable persistent froth (Kaur and Arora, 2009).

Determination of Phenols

FeCl3 and extracts were mixed in equal concentration. Deep bluish solutions show existence of phenols (Harbone, 1998).

Determination of Steroid

Three ml chloroform added in 0.5 g of produced extract and then filtred, after that concentrated sulphoric acid was added to the final extract. The steroid ring is indicated by the appearance of reddish-brown in phase (Trease and Evans, 1989).

Determination of Terpenoids

hafe ml of produced extract and two ml of chloroform was added and a drop of Conc. sulphoric acid was added. Formation of red brown color at the interphase specifies the occurrence of terpenoids.

Result and Discussion

Green tea and black tea were selected for analysis of phytochemicals. Extracts were prepared in solvents i.e. Aqeous, Ethanolic, n-hexane and chloroform**.** Secondary metabolites have the medicinal and physiological activity (Edeogal *et al.,* 2005).Tannins, phenols and terpenoids were found positive in all extracts except n-hexane of black and green teas. Saponins were found positive in all extracts except ethanolic extracts of both teas. As concerned for the research carried out on the saponins, it can only be used for externally rather internally e.g. the saponins presence in the tea seeds had very toxic effects when it was used in *animalia* kingdom (Waheed *et al.,* 2014) Flavonoids were present in rich quantity in all extracts of black and green tea. Steriods were found positive in Aqueous and ethanoilc extracts of black and green tea while seemed absent in n-hexane and chloroform extracts. Flavonoids are polar compounds, so are easily soluble in polar solvent; flavonoid polarity will grow in the presence of sugar bound in the form of glycosides which are more soluble in water (Hanani et al., 2005).

Ethanolic and Aqueous extracts of green tea has higher polyphenol content than n-hexane and chloroform extracts, likewise, aqueous extracts of black tea has higher polyphenol content than other extracts. Comparatively green tea has high polyphenol content than black tea. The phenolic compounds are considered to be one of the main group of plant metabolites (Singh et al., 2007).

Table 1.Secondary Metabolites of Tea Samples

Secondary Metabolites	Extract	Green Tea	Black Tea
Tannins	Aqueous	++	++
	Ethanolic	++	++
	n-hexane	--	--
	Chloroform	++	++
Saponins	Aqueous	++	++
	Ethanolic	--	--
	n-hexane	++	++
	Chloroform	++	++
Flavonoids	Aqueous	++	++
	Ethanolic	++	++
	n-hexane	++	++
	Chloroform	++	++
Phenol	Aqueous	++	++
	Ethanolic	++	++
	n-hexane	--	--
	Chloroform	++	++
Steroids	Aqueous	++	++
	Ethanolic	++	++
	n-hexane	--	--
	Chloroform	--	--
Terpenoids	Aqueous	++	++
	Ethanolic	++	++
	n-hexane	--	--
	Chloroform	++	++

Inhibitory effect of saponins on irritation observed by the previous study while cholesterol binding and hemolytic properties of saponins are also substantial (Just *et al.*, 1998). Tannins have antiseptics, antimicrobial, astringents and antioxidant activity which including anti-mutagenic andanti-carcinogenic property. Regardless of the fact that the higher amount of tannins be the reason of protein precipitation, enzyme inhibition (Chung *et al.*, 1998).

Table 2.Quantitative Phytochemical Analysis of Tea Samples

Samples	Extracts	Amino Acid	Polyphenol
Green Tea	Aqueous	0.202	1.738
	Ethanolic	0.3	1.501
	n-hexane	0.078	0.120
	Chloroform	0.344	0.127
Black Tea	Aqueous	0.851	0.878
	Ethanolic	0.56	0.437
	n-hexane	0.256	0.180
	Chloroform	0.06	0.116

Aqueous extracts of black tea has higher amino acid content than other extracts. Comparatively black tea has higher amino acid content than green tea. Percentage of crude fiber in black tea has higher crude fiber than green tea.

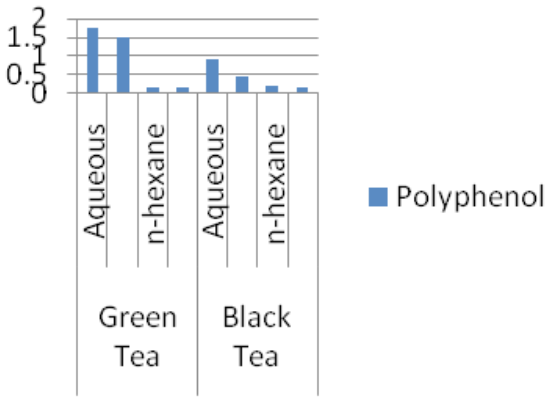

Figure 1.Polyphenol Content

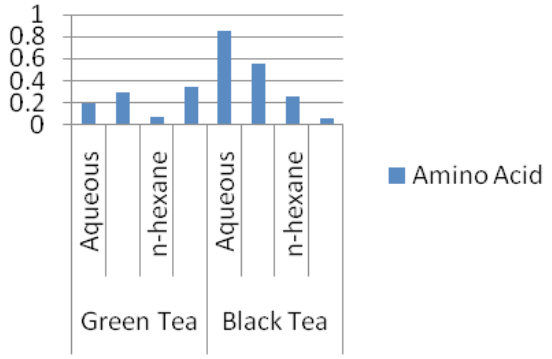

Figure 2.Amino Acid Content

Moisture Content

Moisture content in Green tea and Black tea ranged between 1.16% to 0.36%.These results approved by the early findings of Iqbal., (2002). This indicated that Green tea contained comparatively higher moisture content than Black tea. Moisture content of the tea based upon nature of the tea and their drying time (Kurma *et al.*, 2005). In green tea higher moisture content may be due to prohibiting of fermentation process. polyphenolsof the tea eradicated during this process and as a result moisture content retained.

Table 3.Moisture Content of Tea Samples

Samples	Moisture Content			
	R1	R2	R3	Average
Green tea	0.6	0.4	0.5	1.16
Black tea	0.3	0.4	0.4	0.36

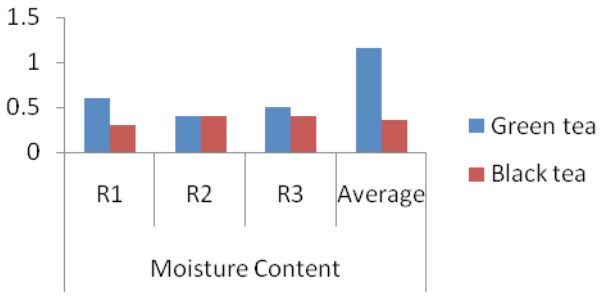

Figure 3.Moisture content of Green and Black tea

Ash Content

Ash content ranged from 1.5 to 1.56 in Green and Black tea. The present outcomes are the same to the previous results accounted by (Iqbal, 2002). This analysis showed that Green tea and Black tea has comparatively same ratio of Ash content.Highercontent of ash indicated that tea can serve as good sources of minerals reported by (Dawodu *et al.*, 2013).

Table 4.Ash Content of Tea Samples

Samples	Ash Content			
	R1	R2	R3	Average
Green tea	1.6	1.5	1.6	1.56
Black tea	1.5	1.5	1.5	1.5

Crude Fiber

Crude fiber varied from 10.4% to 11.1% in Green and Black tea, which was supported by the findings of Iqbal., (2002). Crude Fiber content in tea is also acentral quality control factor. So it found that quantity of crude fiber was higher in Black tea sample rather than Green tea, this is may be due to tea stems Moreover, the process of curling, tearing

and crushing also destroyed the structure of tealeaf and thus fiber content might be effected.

Table 5.Crude fiber extracts of Tea samples

Samples	Crude Fiber			
	R1	R2	R3	Average
Green tea	10.4	11.4	9.5	10.4
Black tea	10.5	12	11	11.1

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