

Research Article

Biochemical and Sensory Evaluation of Processed Black Tea *Camellia assamica*

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A B S T R A C T

The present study was conducted at National Tea and High Value Crops Research Institute Shinkiari during 2020. Three different varieties of *Camellia assamica* processed black tea include P3, P5 and P9 were collected from PARC-National Tea and High Value Crops Research institute (P-NTHRI), Shinkiari, Mansehra, Pakistan. Presences of secondary metabolites in aqueous, methanolic and Ethanolic black tea extract was recognized by its colour intensity using standard chemical tests. Evaluation of tea samples was conducted to establish preference rating of tea for flavor, taste and color. Secondary metabolites like tannin, phenol, glycosides, terpenoids and protein are present in three extract of all tea samples while carotenoid are absent in all three solvent. Flavonoids and saponins are absent in all varieties in Ethanolic and methanolic solvent while present in aqueous solvent while steroids and alkaloids are absent in P3 varieties of aqueous solvent. Tea appearance in P3 is narrow while broad in P5 and P9 and fiber appearance of P3 is low while P5 is medium and P9 is higher. Aroma is more in all varieties and Colour of P5 and P9 is dark brown and P3 is light brown. Tea without milk showed that the aroma of P5 is very strong as compared to other varieties of black tea P3 and P9. The taste of P3 is medium, P5 is better and P9 is highly better and colour of P3 is yellowish brown and P5 is brownish while P9 is dark brown and variation in color was seen from 5-30 mins. Yellowish color of P3 changed to dark brown after 20 minutes and dark brown of P9 changed into blackish brown after 20 mins while no color changed occurred in P5 variety. Tea with milk showed that the aroma of P3 was light and P5 and P9 was strong. Light yellow color was present in P3 and P5 and P9 showed bright yellow color. Taste of P9 was very strong and P3 was lighter while P5 was strong.

Keywords: *Camellia*, Sensory Evaluation, Colour, Aroma, Polyphenols

Introduction

Tea is broadly used as nonalcoholic as well as strong drink all around the world. Naturally it is spread more in the tropical Asia (Martinez *et al.*, 2003). Genus *Camellia* having 82 species belongs to family Theaceae, generally native to the high ground of south India (Lingaiah *et al.*, 2011). Plant is medium sized, evergreen having branches in common condition (Mong and Hsieh, 2007). Tea is absolutely influenced because a permanent monoculture harvest (Jin, 2005). The tea production in the world is reached about 6337976 and covering area is 4193176 hectares (FAO 2018). Metropolitan Sindh along with southern Punjab black tea along milk as well as sugar usually indicates near since "chai", and extensively supplied. Chitral and Gilgit-Baltistan, salty, buttered Tibetan method tea is helped in the northern region of Pakistan (Mahmood *et al.*, 2010). In the world tea is the second largest importer of Pakistan and its consumption is greater 01 Kg/Capta/annum, with the passage of time it may increase with the increase in population (Nathaniel, 1992). However the spot of manufacturing is larger than the future as well as recoument of tea in Pakistan. As profitable manufacture of tea in Pakistan the multinationals were also involved for tea promotion. Since Pakistan imports all tea from outer as well as each head of expenditure likes tea within the country regarding 1 kilogram (Pakistan Investment Guide, 2004). For future breeding programs morphological diversity information should be useful (Rahman *et al.*, 2010) and adapted germplasm is proper conservation of genetic diversity (Ranatunga *et al.*, 2009). Tea quality attributes are assessed through appearance, aroma from volatile compounds and taste. The taste quality is one of the key criteria of professional tea tasters to evaluate the tea quality. (Tarachiwinet *et al.*, 2007). It is a 2nd most important nonalcoholic beverage in the world used in the form of fermented and unfermented tea which had supply antioxidants, polyphenols, amino acids and anti-arteriosclerosis (Fatima and Rizvi *et al.*, 2015). Tea is composed chemically like Flavin, amino acid, arubigin, caffeine, Sugar, alkaloids, polysaccharide, polyphenols, volatile acid, trace element and essential oil. Inclusive value of tea such as aroma, color as well as flavor is owed to wholly these features (Wei *et al.*, 2010; Monobeet *et al.*, 2008; Xionget *et al.*, 2012). Tea consist of minerals such as Calcium, sodium, Potassium, Manganese, Phosphorus, Zinc and Iron (Han and Li, 2002).

Materials and Methods

Keeping in view of tea importance, its medicinal & economic value, widely drunk beverage in the world, especially in Pakistan some key features to be required for investigation properly because locally grown tea have different phenotypic and genotypic features is the primary objective. For the purpose both field and lab studies will

be required to collect data, samples and their analysis for qualitative and quantitative.

Sample Collection

Fresh harvest of tea was obtained from all the 03 clones and processed separately Black Tea Plant and will keep under control condition in quality control Lab of NTHRI.

Bio Chemical Analysis of *Camellia assamica*

Collection of Tea Leaves

Normal leaves from each clone were collected separately than put in the plucking basket.

Withering

Withering will be conducted during processing automatically in BTPP.

Photochemical Screening

Tannis, steroids, flavonoides and saponis was done by various systematic techniques for qualitative identification.

Determination of Flavonoids

Dilute ammonia solution of 5ml was added to the aqueous filtrate of each extract by addition concentrated H₂SO₄. Yellow color in extract shows that flavonoides is present and on standing yellow color is disappear (Trease and Evans., 1989).

Determination of Saponins

In 2 ml of distilled water each sample of (2mg) was suspended as well as energetically stunned the shape of a lathered of approximately 1-2 cm will be explain the sign of saponins occurrence (Chapman & Hall., 1998).

Determination of Tannins

In 2ml of aqueous extract FeCl₂ was added. The presence of yellow brown precipitate was show tannins (Jigna and Sumitra, 2006).

Determination of Terpenoids

Two ml of chloroform was mixed 5ml of each plant extract and after that 3ml concentrated H₂SO₄ will be added carefully which form a layer. The internal faced formed a reddish brown color representing the occurrence of terpenoids (Trease GE and Evans EW., 1989)

Test for Alkaloids

Exactly 1.5ml of 1% HCL was added to the 2ml of methanolic filtrate. Behind heat the solution in water bath, reagent like Mayours reagents/Wagner, s reagent / Drangendroff 6 drops will be added. Orange precipitates formation shows the presence of alkaloids (Oguyemi, 1979).

Cardiac Glycosides

CH₃COOH (1ml) and 1-2 drop of FeCl₂ will be other with 2ml

of alcoholic filtrate followed by 1ml of H₂SO₄ concentrated. Brown ring appearance at the interface show occurrence of cardiac glycosides. Sometime below the brown ring may also appear violet ring (Trease and Evans., 1989).

Detection of Steroids

H₂SO₄ analysis was carrying out for steroids test and In 1 ml extract in test tube 2ml chloroform will be dissolved. After that added H₂SO₄. Reddish brown precipitates appearance on interphase showed occurrence of steroids (Trease and Evan, 1983).

Detection of Carotenoids

Two ml of every extract was taken in test tube for detection of carotenoids and added about 855 sulphuric acids in it. The inter layer of solution will give blue color showed the presences of carotenoids (Kudva et al., 1998).

Detection of Proteins

Biuret test was used to detect proteins and 1 ml of ethanol (95%) and one dive of two percent CUSO₄ will be added in 2ml of extract in test tube and then added potassium hydroxide pellets. Ethanolic pink or brown color layers in simple show that protein is present (Gahan, 1984).

Detection of Phenols

H₂FeO₄ was performed for identification of phenols (Sofowora, 1993; Trease and Evan, 1983). Gymnosporiaroyleana of 2ml extract sample will be treated with some drops of ten percent aqueous FeCl₃. Blue leafy green colour will be show that phenols are present.

Sensory Evaluation of Tea Samples

Black tea samples was conducted for sensory evaluation at NTHRI Shinkiaria Mansehra to establish for choice evaluation of tea for aroma, taste, colour, and flavor as well as in general satisfactoriness. 150ml freshly boil water for Four minutes will be infused with (4g) of tea sample and after that the water will be poured interested in 150ml tea taste porcelain basin in favor of excellence evaluation. For sensory evaluation of tea sample a qualified board of six adjudicators will be employed. Fifteen (15) minutes will be conducted through the panelists earlier than begin of the assessment a preparation gathering. After that, one simple will be offered to each member at a time. In the panel room with prohibited temperature and relative humidity the sensory testing will be completed. The board room was totally free of foodstuff/chemical odors, unnecessary sound and mixing of daylight. Judged will be providing through arranged survey to evidence their sensory comments. (Adnan *et al.*, 2013).

Discussion

Biochemical like Tannins, Terpenoids, Alkaloids, Cardic Glycosides, Phenol and Protein were existing in all varieties

of Ethanolic extracts and chemicals like Flavonoids, Saponins and Carotenoids are absent in all varieties of Ethanolic extract. This might be due to varietal difference which perhaps most suitable for green tea rather black tea and secondly direct deoxidation process also affated the ethanolic solvent.

Table 1. Secondary metabolites of different varieties of black tea in Ethanolic solvent

Secondary metabolites	P3	P5	P9
Flavonides	—	—	—
Saponins	—	—	—
Tannins	+	+	+
Terpenoids	+	+	+
Alkaloids	+	+	+
Cardic Glycosides	+	+	+
Steroids	+	+	+
Carotenoid	—	—	—
Phenol	+	+	+
Protein	+	+	+

Chemical like Flavonides, saponins, Tannins, Terpenoids, Cardic Glycosides, phenol and protein are present in all varieties of black tea in aqueous solvent while Alkaloids and steroids are present in P5 and P9 varieties and absent in P3 varieties and Carotenoid are absent in all varieties of black tea. The tea varieties quite difference in analytical showed among each other might be physiological parameters. Climatic changes also revealed presence of some secondary metabolic had a good sign of varieties under studied and affected the quality particularly in development of aroma.

Table 2. Secondary metabolites of different varieties of black teain aqueous solvent

Secondary metabolites	P3	P5	P9
Flavonides	+	+	+
Saponins	+	+	+
Tannins	+	+	+
Terpenoids	+	+	+
Alkaloids	-	+	+
Cardic Glycosides	+	+	+
Steroids	-	+	+
Carotenoid	-	-	-
Phenol	+	+	+
Protein	+	+	+

Chemical like Flavonides, Tannins, Terpenoids, Cardic Glycosides, phenol and protein are present in all varieties of black tea methanolic solvent while saponins, flavonoids

and carotenoids are absent in all varieties of black tea in methanolic solvent.

Table 3. Secondary metabolites of different varieties of black tea in Methanolic solvent

Secondary metabolites	P3	P5	P9
Flavonides	-	-	-
Phenols	+	+	+
Tannins	+	+	+
Saponins	-	-	-
Alkaloids	+	+	+
Terpenoids	+	+	+
Carotenoids	-	-	-
Glycosides	+	+	+
Steroids	+	+	+
Protein	+	+	+

Sensory Evaluation of Tea Sample

Processed Tea Appearance

The current result showed that the appearance of P3 is narrow while P5 and P9 is broad and Fiber appearance is high in P9, medium in P5 and low in P3. The aroma is same in all varieties. Dark brown color is present in P5 and P9 and light brown is present in P3. Due to leaves tenderness it produced different types of fibers and colour while processed OP and OP-I and BOP categories. Fermentation during CTC process make it + and -. Further oxidation process was started even plucking was not completed which took more time as compared to former session. However it can be improved if plucking, withering, fermentation and rolling could be completed in stipulated time. Because over fermented and under fermented tea didn't produced the desired results.

Table 4. Secondary metabolites of different varieties of black tea in Methanolic solvent

S. No	Tea appearance	Fiber appearance	Aroma	Colour
P3	Narrow	Low	More	Light brown
P5	Broad	Medium	More	Dark brown
P9	Broad	Higher	More	Dark brown

Table 5. Sensory evaluation of black tea samples without milk

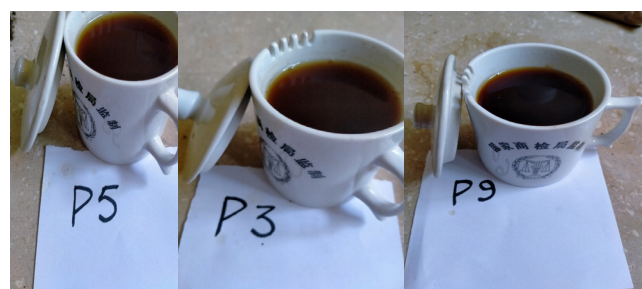
S. No	Aroma	Color	Taste	After 5 min	After 10 mins	After 20 mins	After 30 mins
P3	Light	Yellowish brown	Medium	Brownish	Dark brown	Dark brown	Dark brown
P5	Strong	Brownish	Better	Brownish	Brownish	brownish	Brownish
P9	Very strong	Dark brown	High better	Dark brown	Dark brown	Blackish brown	Blackish brown



Figure 1. Sensory evaluation of black tea varieties samples

Tea Without Milk

Current result showed that the aroma of P5 is very strong as compared to other varieties of black tea P3 and P9. The taste of P3 is medium, P5 better and P9 is highly better. The colour of P3 is Yellowish brown, P5 is brownish while P9 is dark brown. Color of tea is changes after 5-30 mins. Yellowish color of P3 is change into dark brown after 20 minutes and dark brown of P9 is changed into blackish brown after 20mins while no color changed occurred in P5 variety.



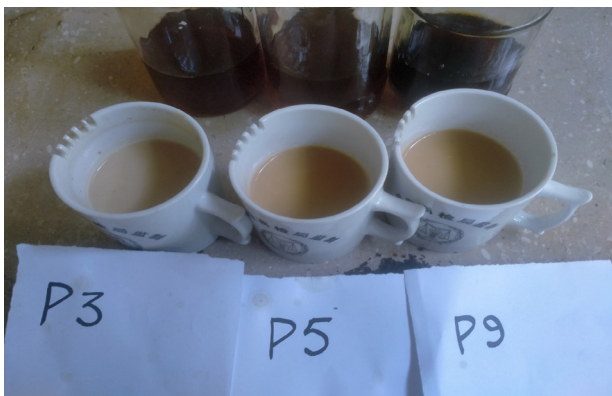
This result showed that the aroma of P3 is light and P5 and P9 is strong. Light yellow color is present in P3 and P5 and P9 is bright yellow color. Taste of P5 is very strong and P3 is lighter while P5 is strong.

Table 6. Tea variety with milk

S. No.	Aroma	Color	Taste	After 5min	After 10min	After 20min	After 30min
P3	Light	Light yellow	Lighter	Light yellow	Light yellow	Light yellow	Light yellow
P5	Strong	Bright yellow	Strong	Bright yellow	Brown	Dark brown	Dark brown
P9	Strong	Bright yellow	Very strong	Bright yellow	Brown	Dark brown	Dark brown

Sensory Evaluation of Black Tea Varieties with Milk

This result showed that the aroma of P3 is light and P5 and P9 is strong. Light yellow color is present in P3 and P5 and P9 is bright yellow color. Taste of P5 is very strong and P3 is lighter while P5 is strong.



Conclusion

All P3, P5 and P9 var; showed presences of secondary metabolites in aqueous, methanolic and Ethanolic black tea extract by its colour intensity. Samples established flavor, taste and color. Secondary metabolites i.e., tannin, phenol, glycosides, terpenoids and protein are present in three extract of all tea samples, while carotenoid are absent. No Flavonoids and saponins in Ethanolic and methanolic solvent while present in aqueous solvent while steroids and alkaloids are absent in P3 varieties of aqueous solvent. Its appearance is narrow, broad in P5 and P9 with low fiber appearance in P3, while other medium to high. Aroma is increasing gradually. Dark brown colour noticed. Tea without milk showed strong aroma in P5, while medium taste in P3, changed to dark brown after 20 minutes further changed into blackish brown after 20 mins in P9, while no color changed occurred in P5 variety. Tea with milk showed that the aroma of P3 was light and P5 and P9 were strong. Light yellow color was present in P3 and P5 and P9 showed bright yellow color. Taste of P9 was very strong and P3 was lighter while P5 was strong. Further studies needed

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