



PHYSICOCHEMICAL AND SENSORY PROPERTIES OF FLAVOURED CEYLON BLACK TEA CONSUMER PACKS

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Abstract

Tea is the second most consumed beverage next to water and Ceylon tea is the finest tea in the international trade. Flavoured teas are one of the most important value-added products exported from Sri Lanka. However, extremely limited studies have focused on physicochemical and sensory properties of flavoured teas exported from Sri Lanka. This study investigated selected physicochemical and sensory properties of ten flavoured black (Broken Orange Pekoe Fanning's: BOPF) teas namely cardamom tea, Earl Grey tea, apple tea, lemon tea, ginger tea, exotic chai tea, peach tea, raspberry tea, cherry tea, and mixed fruit tea. Non-flavoured black tea (BOPF) served as the control. As physicochemical properties moisture, total ash, water-soluble ash, alkalinity of water-soluble ash, and pH were analysed using internationally accepted standard protocols. An in-house trained panel at the Tea Board, Sri Lanka performed sensory attributes (leaf colour, leaf evenness, liquor strength & overall quality) for leaf, infused leaf and liquor properties of the selected flavoured teas. Results showed significant differences ($P < 0.05$) among the samples and compared to control for the studied physicochemical and sensory properties. Moisture, total ash, water-soluble ash, alkalinity of water-soluble ash, and pH of the flavoured teas ranged from $6.46 \pm 0.01 - 9.29 \pm 0.01\%$, $5.76 \pm 0.07 - 6.25 \pm 0.00\%$, $36.57 \pm 1.06 - 43.82 \pm 0.52\%$, $1.83 \pm 0.07 - 2.19 \pm 0.03\%$ and $4.88 \pm 0.01 - 5.02 \pm 0.02$ respectively and complied with the ISO standard requirements given for black tea. The sensory evaluation revealed that raspberry, cherry, cardamom, Earl Grey, and mixed fruit teas were the most preferred teas in terms of tested sensory attributes. In conclusion, flavouring has an effect on physicochemical and sensory properties of black tea.

Keywords: Flavoured Ceylon tea, physicochemical properties, sensory properties, Sri Lankan tea, black tea

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INTRODUCTION

Tea is an infusion made from the leaves of the *Camellia sinensis* plant and the second most consumed beverage next to water world over (Cheng, 2006). Sri Lankan tea or popularly known as Ceylon tea is the finest tea in the world and Sri Lanka remains one of the world's leading tea producers for more than 150 years (Mudiyanselage and Gayani, 2021). The tea sector in Sri Lanka accounts for 17% of the total export earnings and over 1.5 million people are employed in the tea industry. Black tea, green tea, and many value-added teas are exported from Sri Lanka. Among value-added Ceylon teas, flavored teas are a major export which accounts for 40-45% of total tea export from Sri Lanka (Herath and De Silva, 2011). However, to date extremely few studies have focused on studying physicochemical, sensory and health aspects of Ceylon flavored teas. The present study investigated physicochemical and sensory properties of a range of flavored Ceylon black tea consumer packs.

METHODOLOGY

Tea Samples Collection

Ten different flavoured black tea (BOPF) samples namely (Cardamom flavoured tea, Earl Grey flavoured tea, apple flavoured tea, lemon flavoured tea, ginger flavoured tea, exotic chai flavoured tea, peach flavoured tea, raspberry flavoured tea, cherry flavoured tea and mixed fruit flavoured tea) were collected from the Tea Board, Sri Lanka. Black tea (BOPF) without flavour was served as the control.

Preparation of Tea Brew

The tea brew was made according to the international organization for standardization (ISO 3103): by adding 2 g of tea sample to 100 mL of boiling water and brewing for 5 min. The tea brew was squeezed through a muslin cloth and samples were stored in an airtight container at 4 °C until use.



Determination of Physicochemical Properties

The tea sample were examined for moisture content, total ash content, water-soluble ash content and alkalinity of water-soluble ash content according to ISO 1573: 1980, ISO 1575:1987, ISO 1576:1988 and ISO 1578:1975 standards respectively. Selected tea samples were studied for pH using a properly calibrated pH meter (STARTER 3100 OHAUS). The results of total ash, water-soluble ash and alkalinity of water-soluble ash were expressed on % dry weight basis.

Evaluation of Sensory Properties

The sensory properties of tea samples were assessed by a panel of professional tea tasters in the Tea Board, Sri Lanka, according to the ISO 3103 standard. As sensory properties Leaf, infused leaf liquor, aroma and flavor properties were studied for the selected tea samples.

RESULTS AND DISCUSSION

Physicochemical properties of selected tea samples

Physicochemical properties of selected tea samples are given in Table 1. Results showed significant differences ($P < 0.05$) among the samples and compared to the control for the studied physicochemical properties. Moisture, total ash, water-soluble ash, alkalinity of water-soluble ash, and pH of the flavoured teas ranged from 6.46 ± 0.01 - 9.29 ± 0.01 , 5.76 ± 0.07 - 6.25 ± 0.00 , 36.57 ± 1.06 - 43.82 ± 0.52 , 1.83 ± 0.07 - 2.19 ± 0.03 and pH 4.88 ± 0.01 - 5.02 ± 0.02 respectively (Control: Moisture - 9.29 ± 0.01 , total ash - 6.25 ± 0.00 , water-soluble ash- 43.82 ± 0.52 , alkalinity of water-soluble ash - 2.16 ± 0.04 , and pH- 5.02 ± 0.02). According to the ISO standard requirements for non-flavored black tea, moisture, total ash, water-soluble ash, alkalinity of water-soluble ash, and pH have to be ranged from $<9\%$, $4-8\%$, $<45\%$, $1-3\%$, and pH 5.00 - 6.00 respectively. Thus, selected flavoured tea samples complied with the ISO standard requirements.

Table 1. Physicochemical properties of selected black tea samples

Tea Sample	% Moisture content	% Total ash content	% Water soluble ash content	%Alkalinity of water- soluble ash content	pH
Black tea (control)	9.29 ± 0.01^a	6.25 ± 0.00^a	43.82 ± 0.52^a	2.16 ± 0.04^a	5.02 ± 0.02^a
Cardamom tea	8.86 ± 0.01^b	6.16 ± 0.01^a	43.20 ± 0.72^a	2.22 ± 0.04^a	4.96 ± 0.00^a
Earl Grey tea	8.79 ± 0.07^b	6.14 ± 0.00^a	43.20 ± 0.12^a	2.16 ± 0.01^a	4.90 ± 0.01^{ab}
Apple tea	8.38 ± 0.02^c	6.09 ± 0.00^a	41.40 ± 1.11^{ab}	2.13 ± 0.00^a	4.88 ± 0.01^{abc}
Lemon tea	8.33 ± 0.01^c	6.06 ± 0.02^{ab}	41.25 ± 0.01^{abc}	2.19 ± 0.03^a	4.96 ± 0.00^{bc}
Ginger tea	7.77 ± 0.03^d	6.04 ± 0.01^{abc}	40.84 ± 0.67^{abc}	1.93 ± 0.01^{ab}	4.91 ± 0.00^{bc}



Exotic chai tea	7.76 ± 0.07 ^d	6.03 ± 0.10 ^{abc}	40.49 ± 0.93 ^{abc}	2.05 ± 0.01 ^{ab}	4.96 ± 0.00 ^c
Peach tea	7.51 ± 0.02 ^c	5.99 ± 0.02 ^{abcd}	39.85 ± 0.18 ^{abc}	1.83 ± 0.07 ^{ab}	4.98 ± 0.00 ^c
Raspberry tea	7.21 ± 0.01 ^f	5.80 ± 0.02 ^{bcd}	39.40 ± 0.62 ^{abc}	2.11 ± 0.02 ^{abc}	4.96 ± 0.00 ^d
Cherry tea	7.01 ± 0.02 ^f	5.79 ± 0.01 ^{cd}	38.43 ± 0.30 ^{bc}	2.18 ± 0.00 ^{bc}	5.01 ± 0.01 ^d
Mixed fruit tea	6.46 ± 0.01 ^g	5.76 ± 0.07 ^d	36.57 ± 1.06 ^{bc}	2.16 ± 0.04 ^a	5.00 ± 0.00 ^d

Results expressed as mean ± standard error. Mean values super-scripted by different letters are significantly different at P < 0.05).

Physicochemical properties (moisture content, total ash content, water-soluble ash content and alkalinity of water-soluble ash content) complied with the ISO standard requirements. However, significant differences were observed among the different teas tested in the study. The pH value of tea is slightly acidic.

Sensory properties of selected tea samples

The radar diagrams show the mean ranking scores for the various sensory attributes for studied tea samples. Cherry and raspberry-flavoured teas received the highest leaf colour ratings, while lemon tea received the lowest. Cardamom tea had the best leaf evenness, while exotic chai had the worst. Cardamom tea received the highest score for infused leaf, while exotic chai received the lowest. In terms of liquor colour, Earl Grey tea received the highest score, while black tea, lemon, and exotic chai received the lowest. For liquor strength, black tea, cardamom, apple, cherry, and mixed fruit teas were ranked highest, while ginger and raspberry teas were ranked lowest. Cherry tea had the highest overall quality rating, while raspberry tea had the lowest. Apple, lemon, cherry, and mixed fruit teas received the highest flavour and aroma scores, while raspberry tea received the lowest flavour score. The aroma scores for lemon, raspberry, and mixed fruit teas were the highest, while the remaining teas received the lowest. According to the sensory characteristics of tea samples, cherry, cardamom, Earl Grey, and mixed fruit teas were the best.



Figure 1. Radar diagram for leaf sensory attribute of tea samples



Figure 2. Radar diagram for infused leaf sensory attribute of tea samples



Figure 3. Radar diagram for liquor sensory attribute of tea samples



Figure 4. Radar diagram for flavour sensory attribute of tea samples

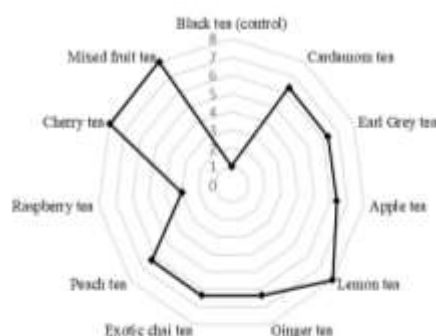


Figure 5. Radar diagram for aroma sensory attribute of tea samples

CONCLUSION

Physicochemical and sensory properties varied significantly among the samples and compared to the control. However, tested physicochemical properties of flavored black tea complied with the ISO standard requirements given for black tea. The sensory evaluation showed that raspberry, cherry, cardamom, Earl Grey, and mixed fruit teas were the most preferred teas in terms of tested sensory attributes. In conclusion, flavoring has an effect on physicochemical and sensory properties of black tea.

ACKNOWLEDGMENTS

The Authors acknowledge the Tea Board, Sri Lanka for providing samples for the study.

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