Determination of Selective Chemical Quality Parameters of Commercial Tea Blends

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Introduction

Tea (*Camellia sinensis* L.) is the second most widely consumed popular non-alcoholic beverage in the world for centuries due to its sensory attributes and health promoting effects. About 3x10 9 kg of various teas is consumed every year as a whole (Lu et al., 2004). Commercially, tea is used in blends combining several grades originated from different elevations and agro-climatic conditions. Those are distributed around the country through the auction and other meansunder different estate marks. This study was an effort to add more information on chemical quality of commercial tea blends by evaluating selected chemical quality parameters and comparing those with selected parallel products available in Australian market under different brands.

Methodology

The current study was carried out at Ceylon Tea Services PLC (CTS), Paliyagoda. Laboratory analysis was done at SLAB accredited chemical laboratory of Food Technology Department at CTS. Thirteen types of company standard green tea and black tea blends were evaluated.Total polyphenol content, caffeine content, moisture content of tea blends and pH, total soluble solid content, colour intensity of the brew were measured for 8 black tea blends 2 local green tea blends and 3 imported green tea blends. Chemical quality parameters were compared with 5 different tea brands under 5 different product categories. Five competitor samples (Twinings, Woolworth, Lipton, Abeya and Madura) which represent the leading brands in international tea market were compared with selective tea standards using chemical quality parameters. Those different tea blends which were used to produce different teas were considered as treatments. Total polyphenol content was determined according to the International Organization for Standardization method (ISO) 14502-1. Caffeine determination was based on Jenway Bibby Scientific (Application note: A09-010A). Moisture content (loss in mass at 103 °C) was determined on a portion of test sample in accordance with ISO 1572:1980 for leaf tea. The value for total soluble solids (TSS) of brew was measured using a refractometer(Atago, Japan) at 20°C (Borse et al., 2012).The color intensity of the tea brew was measured using a spectrophotometer at 450 nm (Halligudi et al., 2012). pH value of tea brew was measured using a pH meter (Cyberscan, Japan) at 25 C (Halligudi et al., 2012).Data were analyzed using the statistical procedure of one way analysis of variance (ANOVA) at 5 % level of significance and mean comparison was done using Tukey test at 95 % confidence interval using Minitab 16 statistical software.

Results and Discussion

As in Figure 1, in black teas the highest polyphenol content (TPC) was found in BT 1 (17.10 ± 0.74% GAE).BT 1 was a combination of high and medium grown pure single origin Sri Lankan tea with medium strength and good cup colour. The lowest polyphenol content was found in BT 2 (14.24 ± 1.70% GAE). BT 2 was a blend of low and medium grown pure single origin Sri Lankan black teas. Total polyphenol content in high grown teas were the highest total polyphenol content holders then mid grown and finally low grown teas (Abeywickrama et al., 2013). The highest caffeine content was recorded in BT 6 (3.18 ± 0.02%).BT 2 showed the

lowest caffeine content (2.90 ± 0.12%).The highest moisture content was recorded in BT 2 (8.37 ± 0.41%). BT 5 showed the lowest moisture content (5.78 ± 0.22%). The highest PH content was recorded in BT 4 (5.1 ± 0.2). BT 8 showed the lowest PH content (4.8 ± 0.3).The highest soluble solids in black tea brew were recorded in BT 5 (0.5 ± 0.0%) BT 2 showed the lowest soluble solids in tea brew (0.1 ± 0.0%).Highest value for colour was obtained by BT 5 about 1.969 ± 0.030. Lowest value was obtained by BT 2 about 1.006 ± 0.041.

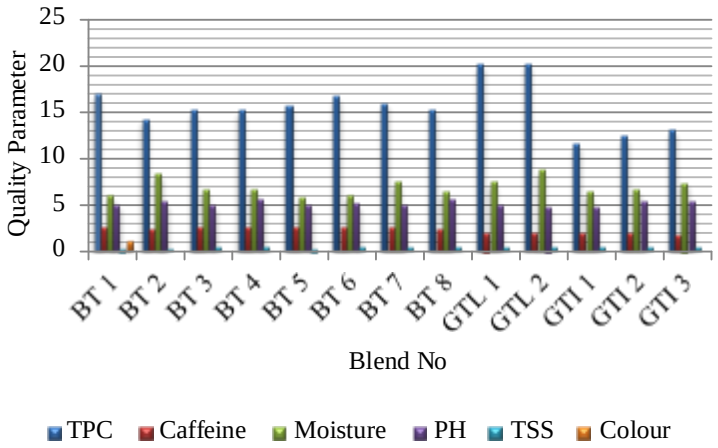

Figure 2. Chemical quality of different tea blends [TPC-% Gallic Acid Equivalents (GAE), Caffeine-g/100g, Moisture-%, TSS- Brix%, PH-PH scale, Colour-Absorbance at 450 nm].

In green teas, the highest polyphenol content was found in GTL 2 and it was 20.3 ± 1.10% GAE and GTL 1 20.19 ± 0.33% GAE. GTL 2 was a medium grown and GTL 2 was a high grown green tea blend in Sri Lanka. Imported green tea blends evaluated showed a less polyphenol content values. In imported green teas recorded highest value was 13.14 ± 0.814% GAE found in GTI 3.The highest value of caffeine was found in GTL 1(2.50 ± 0.34%) and the lowest was GTI 3 (1.97 ± 0.30 %). The highest value of moisture was found in GTL 2 (8.79 ± 0.48%) and the lowest was GTI 1 (6.42 ± 0.04%). The highest value of PH was found in GTI 3 (5.6 ± 0.3) and the lowest was GTL 2 (5.3 ± 0.2). The highest value of soluble solids in tea brew wa s found in GTI 1 (0.4 ± 0.0%) and the lowest was GTI 3 (0.2 ± 0.0%).Green tea cup colour intensity ranged in lower values.

All chemical quality parameters showed significant differences between different tea blends according to one way ANOVA and grouping information using Tukey method ($p<0.05$).

Total polyphenol content showed a higher variation in values in A, B and C consecutive preparations. Moisture content and the PH content were slightly varied and caffeine content, colour intensity, total soluble solids showed a consistency among three preparations.

According to the scenario of comparison of competitor sample recorded values based on the quality parameters were shown in Figure 2, 3, 4, 5, 6 and 7.

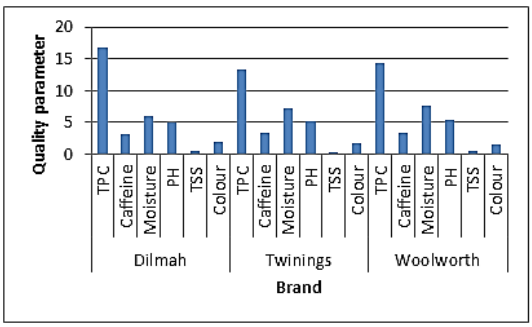

Figure 2. Chemical quality of English breakfast blend category in different brands.

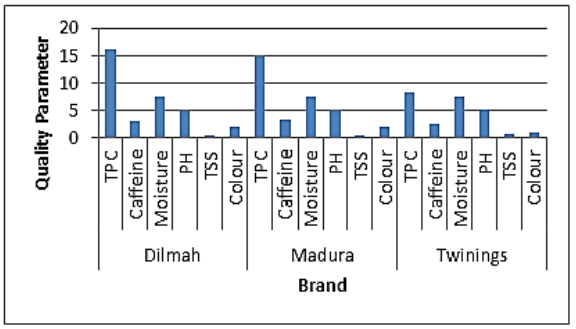

Figure 3. Chemical quality of Earl Grey blend category in different brands.

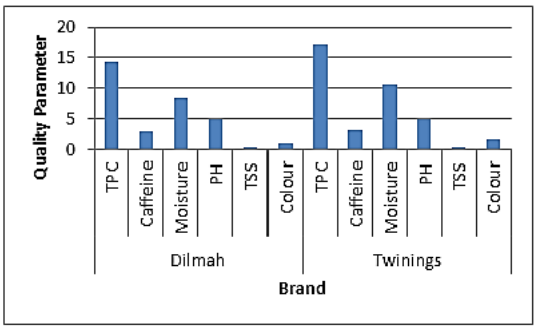

Figure 4. Chemical quality of Ceylon Orange Pekoe blend category in different brands.

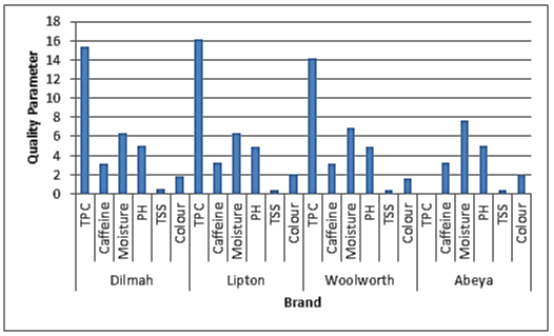

Figure 5. Chemical quality of Premium blend category in different brands.

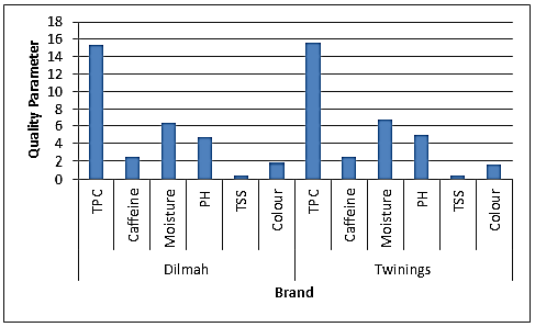

Figure 6. Chemical quality of Traditional Afternoon blend category in different brands.

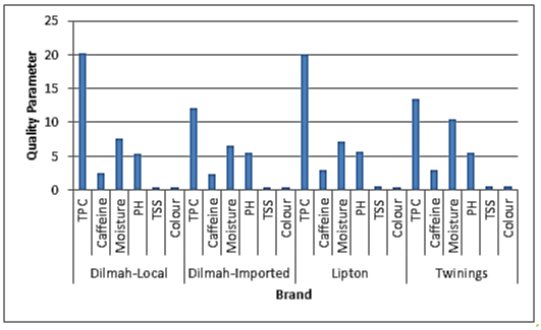

Figure 7. Chemical quality of Green tea blend category in different brands.

[TPC-% Gallic Acid Equivalents (GAE), Caffeine-g/100g, Moisture-%, TSS- Brix^0%, PH-PH scale, Colour-Absorbance at 450 nm]

Conclusions

Sri Lankan origin black tea and green tea blends are in higher chemical quality compared to that of green tea from other origins. Variations among three consecutive preparations show that even though the physical nature evaluated by tea tasters' specially cup colour of a blend is quite similar, the chemical nature has some differences in the same blend. Different tea blend categories of different market samples show significant differences in chemical quality.

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