

Regional Variation of Total Polyphenol Content and Dry Matter in BOPF Black Tea from Selected Sri Lankan Tea-Growing Regions

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Polyphenol composition in black tea plays an important role in antioxidant activity, sensory quality, and health benefits. Understanding regional variations in polyphenol content is important for tea quality assessment and origin authentication. This study aimed to compare the total polyphenol content (TPC) and dry matter content of Broken Orange Pekoe Fannings (BOPF) black tea from selected Sri Lankan tea-growing regions and evaluate their potential for regional differentiation. BOPF was selected because its fine particle size facilitates efficient extraction and provides reliable analytical measurements. It is also one of the most widely used grades in tea bags and commercial blends. Tea samples were collected from five major tea-growing regions of Sri Lanka: Sabaragamuwa, Dimbula, Ruhuna, Udu Pussellawa, and Uva. Ten factory-grade samples were obtained from each region to ensure representative sampling. Dry matter content was determined according to ISO 1572 and used to express results on a dry weight basis, while TPC was determined using the Folin–Ciocalteu colorimetric method according to ISO 14502-1:2005(E). Absorbance was measured at 765 nm using a UV–Visible spectrophotometer. All analyses were performed in triplicate, and statistical evaluation was conducted using one-way analysis of variance (ANOVA). The mean ($\pm$ SD) TPC values ranged from 15.38 ± 1.36 %DW in Uva to 24.31 ± 1.98 %DW in Ruhuna. Dry matter content ranged from 90.92 ± 0.51 % in Dimbula to 94.60 ± 0.70 % in Sabaragamuwa. ANOVA revealed significant regional differences in both TPC ($F = 12.11$, $p < 0.001$) and dry matter content ($F = 20.61$, $p < 0.001$). These variations may be influenced by regional agro-climatic conditions, including elevation, temperature, rainfall, and soil characteristics, as well as differences in factory-level processing practices. The findings demonstrate that TPC and dry matter profiles provide region-specific biochemical information that may support future studies on tea origin verification, quality assessment, and future analytical approaches for regional classification of Sri Lankan black tea.

Keywords: BOPF black tea, Total polyphenol content, Dry matter content, Regional variation, Sri Lankan tea