

Quantification of Total Polyphenols and Flavonols in Sri Lankan Black Tea

B. Jeganathan¹, P.A.N. Punyasiri², and T. Madhujith¹

¹*Department of Food Science and Technology, Faculty of Agriculture,
University of Peradeniya*

²*Biochemistry Division, Tea Research Institute of Sri Lanka, Talawakelle*

Tea produced in Sri Lanka, which has been well known as Ceylon Tea, is acclaimed as one of the best teas in the world. The unique characteristics of Ceylon tea, reputed for more than a century, are influenced by climatic conditions of plantations. Tea is the second most popular drink, which represents a major source of dietary polyphenols. The polyphenolic fraction in tea, which represents 30 to 40% (w/w) of solid compounds, serves as dietary antioxidants. Black tea contains significant amounts of flavonols, such as quercetin, myricetin and kaempferol, which are known to possess health promoting properties. However, there is very little work carried out to date to quantify flavonols in Sri Lankan black tea samples. The present study was carried out in this backdrop, with the objective of quantifying total polyphenols and flavonols present in upcountry, low country, mid country and Uva grown black tea.

Samples of (500 g) Broken Orange Peckoe (BOP) tea were obtained from 29 estates belonging to 10 different geographical locations of low country, midcountry, upcountry and Uva regions. Upcountry tea samples were collected from Dimbula, Nuwara Eliya, Bogawanthalawa, Udapusselawa and Agrapatana. Mid country was obtained from Kandy while low country tea was obtained from Ruhuna and Sabaragamuwa sub regions. Uva tea was obtained from Malwatte Valley and Bandarawela. All samples were collected during December 2010. The total polyphenolic content of tea samples was determined in quadruplicate using ISO 14502-1 method and expressed as percent gallic acid equivalent (GAE) on dry matter basis. Total flavonols and flavones were quantified using four different aluminum chloride methods and results were expressed as both rutin equivalents (RE) and quercetin equivalents (QE). Further, the conditions necessary for hydrolysing and analysing flavonols in tea infusions were optimised and the hydrolysed flavonols were quantified using HPLC.

Total polyphenolic content of black tea samples ranged from 11.66 ± 0.58 to $25.41 \pm 0.58\%$ GAE (w/w) on dry matter basis. Up country tea brew contained the highest quantity of total flavanols and flavones (18.82 mg RE/g), while the low country tea contained 11.46 mg RE/g. The flavonols and flavones of upcountry and Uva teas were significantly ($P < 0.05$) different from those of mid and low country. The contents of myricetin, quercetin and kaempferol in black tea ranged from 0.25 ± 0.01 to 6.48 ± 0.39 , 0.79 ± 0.06 to 20.60 ± 0.86 , and 0.52 ± 0.02 to 7.42 ± 0.89 mg/g, respectively. These results indicate that tea from different regions, sub regions and estates were significantly ($P < 0.05$) different suggesting that the geographical location and/ or the growing condition has an impact on these contents.