2551 - Developing an Efficient Green Approach for The Extraction of Polyphenol from Spent Tea

K. Thadchajini[1] and S. Sivakanthan[1]

Tea (Camellia sinensis) consumption generates spent tea as a by-product, which is rich in bioactive compounds such as polyphenols. This study focused on developing a sustainable green extraction method to efficiently recover these valuable bioactive compounds from spent tea. Air-dried spent tea samples were pretreated using three methods; microwave-oven drying (P30 and P50 for 15 minutes), oven drying (50 °C and 60 °C for 5 hours) and steaming (10 minutes and 15 minutes). Pretreated samples were extracted using shaking method (200 rpm for 48 hours) with two solvent systems: glycerol-water mixture (30%, v/v) and acetic acid buffer (pH 1.5). Different sample: solvent ratios (w/v) (1:10, 1:20, 1:30) were used to select the optimum ratio. The samples were analyzed for total phenolic content (TPC), total flavonoid content (TFC), total antioxidant content (TAC) and antioxidant activity (AA) using phosphomolybdenum assay. The traditional (Soxhlet) extraction method served as the control. Data were analyzed using One – way ANOVA and Nested ANOVA using MINITAB (17). The sample: solvent ratio of 1:30 ratio yielded the highest TFC, which was subsequently used for further studies. The glycerol-water mixture yielded the significantly highest TFC in the control sample (48.19±0.60 mg gallic acid equivalent/g) and microwave oven-dried sample (at P30 for 15 minutes) (46.26±0.33 mg gallic acid equivalent/g). TFC and TAC were significantly higher ($p<0.05$) in all pretreated samples than control sample. Microwave oven drying (at P30 for 15 minutes) combined with the glycerol-water solvent resulted in the highest TFC (171.65±1.26 mg quercetin equivalent /g). The highest AA ($p<0.05$) was observed in samples pretreated by oven-drying (at 60°C for 5 hours) (0.152±0.00 mg ascorbic acid equivalent/g) and steaming (for 10 minutes) (0.163±0.019 mg ascorbic acid equivalent/g) with the glycerol-water mixture. Compared to the Soxhlet method, shaking method yielded higher ($p<0.05$) TPC and TFC. In conclusion, this study suggests that the extraction of polyphenols using the shaking method combined with a glycerol water mixture is an effective and environmentally friendly approach to extract bioactive compounds from spent tea.

Keywords: antioxidants, extraction, flavonoid content, phenolic content, spent tea

[1]Department of Agricultural Chemistry, Faculty of Agriculture, University of Jaffna, Sri Lanka