

Optimization of Ultrasound-Assisted Extraction and Microwave-Assisted Acid Digestion for the Determination of Heavy Metals in Tea Samples

Authors : Abu Harera Nadeem, Kingsley Donkor

Abstract : Tea is a popular beverage due to its flavour, aroma and antioxidant properties—with the most consumed varieties being green and black tea. Antioxidants in tea can lower the risk of Alzheimer’s and heart disease and obesity. However, these teas contain heavy metals such as Hg, Cd, or Pb, which can cause autoimmune diseases like Graves disease. In this study, 11 heavy metals in various commercial green, black, and oolong tea samples were determined using inductively coupled plasma-mass spectrometry (ICP-MS). Two methods of sample preparation were compared for accuracy and precision, which were microwave-assisted digestion and ultrasonic-assisted extraction. The developed method was further validated by detection limit, precision, and accuracy. Results showed that the proposed method was highly sensitive with detection limits within parts-per-billion levels. Reasonable method accuracy was obtained by spiked experiments. The findings of this study can be used to delve into the link between tea consumption and disease and to provide information for future studies on metal determination in tea.

Keywords : ICP-MS, green tea, black tea, microwave-assisted acid digestion, ultrasound-assisted extraction

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