

Quantitation of Essential Minerals in Sports Drinks via ICP-AES

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Structured Abstract

Background: Sports drinks are widely consumed due to their ability to replace fluids, carbohydrates and electrolytes that are lost during physical activities. However, while being beneficial for athletes, there are concerns regarding the inconsistency of mineral labelling, potential adulteration and adolescents' consumption of commercially available sports drinks. This study aims to quantify and compare the essential elements in various brands of sports drinks (Na, K, Mg and Ca) with their declared concentrations on labelling by using ICP-AES and FAAS.

Methods: Six commercial sports drinks were purchased locally. Standard solutions of Na and K (0.1–1.0 ppm. While Mg, and Ca (0.5–5.0 ppm) were prepared from 1000 ppm stock solutions. Each drink samples (2mL) was treated with 1% HNO₃ then marked up with deionized water. Na and K were analysed by ICP-AES, and Mg and Ca by FAAS using PerkinElmer instruments. All measurements were performed in triplicate.

Results: External standard calibration method was constructed, and good linearity were achieved for Na, K, Mg and Ca calibration curves with R^2 0.9974, 0.9873, 0.9146 and 0.9972 respectively. Na and K measured were present at significantly high concentrations. While Mg and Ca measured present at low concentrations. All samples were analysed in triplicate to ensure the precision and repeatability of the measurements. The replication measurement precision was assessed based on percent RSD. With %RSD not exceeding 15%, which considered the methods used in this study were acceptable and precise.

Conclusion: In conclusion, ICP-AES and FAAS can be precisely used to quantify Na, K, Mg and Ca in commercially available sports drinks brands using external calibration method. Precision was acceptable (%RSD < 15%), and calibration curves showed strong linearity ($R^2 > 0.995$). Na and K were present in significantly higher concentrations than Mg and Ca This highlights importance of quality control in elements labelling especially when the sports drinks are being highly marketed to adolescents.

Keywords: Sports drinks, elements, ICP-AES, FAAS, adolescents

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