

Quantification of caffeine and 5-Caffeoylquinic Acid (5CQA) in seven European commercial roasted coffees (*Coffea arabica*) using HPLC-PDA

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Coffee is the second most consumed beverage in the world. Coffee infusions exert beneficial biological effects in the human body, generating significant health benefits attributed to caffeine and other phenolic compounds. This study was conducted to quantify caffeine and 5-Caffeoylquinic Acid (5CQA) concentrations in seven different types of commercially available roasted coffee with varying intensities: 1. Ristretto Espresso, 2. Viola Espresso, 3. Classico Espresso, 4. Espresso Intense, 5. Forte Lungo, 6. Milano Dolce Gusto, and 7. Decaffeinated Espresso, which are popular in Europe and globally. To extract caffeine and 5CQA, three methods were utilized: (1) heat refluxing with 40 mL of 60% methanol followed by a 20-fold dilution, (2) hot water extraction (30 or 50 mL) using a coffee machine followed by a dilution to 1000 mL, and (3) hot water extraction (300 mL) using a coffee machine followed by a dilution to 1000 mL. Caffeine and 5CQA were quantified using an HPLC-PDA system with an InertSustain Phenyl column, employing an isocratic procedure with 7% acetonitrile and 0.1% phosphoric acid as the mobile phase at wavelengths of 275 nm and 325 nm for caffeine and 5CQA, respectively. Methanolic extraction yielded higher concentrations of caffeine and 5CQA than the water extraction methods due to the increased solubility of the tested compounds in methanol. Based on method 3, which produced higher yields of caffeine and 5CQA, the highest concentration of 5CQA was found in the Forte Lungo espresso type (26.6 ± 0.6 mg/capsule), followed by the decaffeinated espresso (25.9 ± 0.5 mg/capsule). The highest caffeine concentration was found in Milano Dolce Gusto (109.3 ± 0.6 mg/capsule). The caffeine-to-5CQA ratios recorded in the tested coffee types were 4.69, 3.37, 2.29, 4.08, 2.09, 4.08, and 0.13. Based on these findings, we recommend that the most health-beneficial coffee sample tested in this study is the decaffeinated espresso.

Keywords: 5-CQA, Caffeine, Extraction, HPLC, Roasted coffee