NMR-Based Metabolomic Profiling of Red Wine and Black Tea

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Abstract:

Polyphenols linked to health benefits make them potential biomarkers for dietary intervention studies. The specific metabolites involved and their interactions with the gut microbiota are not thoroughly researched. This study implements 1H NMR spectroscopy to analyze the metabolite profiles obtained after the consumption of polyphenol-rich beverages.

A total of 62 volunteers (aged 18-25 years) participated in the controlled feeding trial, which involved consumption of red wine or black tea over two days and consequent structured sample collection. Statistical analysis with MestreNova, Microsoft Excel, and Metaboanalyst revealed beverage-derived key polyphenolic phase II metabolites, like caffeine, catechin, resveratrol, and their derivatives.

The sex-based comparative study revealed that the males exhibited a faster polyphenol metabolism with more sulphated metabolites than females, who exhibited more glucuronidated metabolites and elevated creatine excretion. Caffeine metabolism varied significantly between different individuals. As commonly observed, males have a faster caffeine metabolism than females. A higher polyphenol recovery was noted after wine consumption, when compared to tea.

These results underline the significance of tailored nutritional strategies based on metabolic variation and the potential benefits of NMR spectroscopy while conducting a metabolomic study.

Keywords:

Polyphenols, Bioactive compounds, Red wine, Black tea, Proton NMR, Multivariate analysis, Caffeine metabolism, Gut microbiota.