Metabolite profiles of red and white rice aqueous extracts derived at different temperatures and their relationship with biological propertiesas determined using 1H-NMR-based metabolomics analysis

ABSTRACT

Consumption of pigmented rice has continued to increase in recent years, due in part to its potential health promoting properties, especially protection against chronic diseases. Chemical extracts of red rice have demonstrated strong ability to scavenge free radicals, however little is yet known about water extracts of red rice. The antioxidant activity, α-glucosidase inhibition, nitric oxide inhibition, and metabolic profiling of this cultivar's water extracts have yet to be investigated. In this study, red rice and white rice were extracted using ultrasound-assisted hydrothermal extraction at three different temperatures. The total phenolic content (TPC) as well as the DPPH radical scavenging, α-glucosidase inhibitory, and nitric oxide (NO) inhibitory activities of each extract were determined. NMR analysis was performed to find out the metabolite profiles of the extracts. Correlations between the metabolites and the biological activities of the rice extracts were then investigated using metabolomics analysis. Results show that the red rice aqueous extracts had a higher TPC than the white rice extracts. The highest extraction temperature led to a decrease in the TPC. However, the extraction temperature did not affect the radical scavenging, α-glucosidase inhibitory, or NO inhibitory activities of the red rice extracts. The PCA results indicated extract discrimination by extraction temperature. The PLS score plot exhibited the potentials of red rice aqueous extracts on the α-glucosidase and NO inhibitory activities. The 1H-NMR-based metabolomics analysis shows that red rice aqueous extract possesses beneficial properties which can make it useful as an ingredient for functional foods or other products.

Keyword: 1H-NMR-based metabolomics; Biological properties; Red pigmented rice; Hydrothermal extraction; Ultrasonic-assisted extraction