Urinary metabolomics study on the protective role of Orthosiphon stamineus in Streptozotocin induced diabetes mellitus in rats via 1H NMR spectroscopy

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Abstract

Background: Orthosiphon stamineus (OS) is a herb known in ethnomedicine for treating diabetes mellitus (DM). In this study, a 1H NMR based urine metabolomics tool has been used for the first time to identify the metabolic protective mechanism of OS in DM using Streptozotocin (STZ) induced experimental model in rats. Methods: Four different solvent extracts of OS, namely aqueous, ethanolic, 50% aqueous ethanolic and methanolic, at a dose of 500 mg/kg body weight (bw) were orally administered for 14 days to diabetic rats induced via intraperitoneal injection of 60 mg/kg bw STZ. NMR metabolomics approach using pattern recognition combined with multivariate statistical analysis was applied in the rat urine to study the resulted metabolic perturbations. Results: OS aqueous extract (OSAE) caused a reversal of DM comparable to that of 10 mg/kg bw glibenclamide. A total of 15 urinary metabolites, which levels changed significantly upon treatment were identified as the biomarkers of OSAE in diabetes. A systematic metabolic network analysis identified that OSAE contributed to the anti-diabetic activity mainly through background.