

NMR and LCMS analytical platforms exhibited the nephroprotective effect of *Clinacanthus nutans* in cisplatin-induced nephrotoxicity in the in vitro condition

ABSTRACT

Background: *Clinacanthus nutans* (*C. nutans*) Lind. locally known as Belalai Gajah or Sabah snake grass is a medicinal plant belonging to Acanthaceae family. In Asia, this plant is traditionally used for treating skin rashes, insects and snake bites, diabetes mellitus, fever and for diuretic effect. *C. nutans* has been reported to possess biological activities including anti-oxidant, anti-inflammation, anti-cancer, anti-diabetic and anti-viral activities. Methods: Proton Nuclear Magnetic Resonance (^1H NMR) and Liquid Chromatography Mass Spectroscopy (LCMS) coupled with multivariate data analysis were employed to characterize the metabolic variations of intracellular metabolites and the compositional changes of the corresponding culture media in rat renal proximal tubular cells (NRK-52E). Results: NMR and LCMS analysis highlighted choline, creatine, phosphocholine, valine, acetic acid, phenylalanine, leucine, glutamic acid, threonine, uridine and proline as the main metabolites which differentiated the cisplatin-induced group of NRK-52E from control cells extract. The corresponding media exhibited lactic acid, glutamine, glutamic acid and glucose-1-phosphate as the varied metabolites. The altered pathways perturbed by cisplatin nephrotoxic on NRK-52E cells included changes in amino acid metabolism, lipid metabolism and glycolysis. Conclusion: The *C. nutans* aqueous extract (1000 $\mu\text{g}/\text{mL}$) exhibited the most potential nephroprotective effect against cisplatin toxicity on NRK-52E cell lines at 89% of viability. The protective effect could be seen through the changes of the metabolites such as choline, alanine and valine in the *C. nutans* pre-treated samples with those of the cisplatin-induced group.

Keyword: Cisplatin; *Clinacanthus nutans*; NRK-52E; Nephroprotective effect