ABSTRACT

Background: *Solanum torvum* Swartz, a medicinal plant belongs to family Solanaceae, is an important medicinal plant widely distributed throughout the world. It is consumed as food and used as medicine to treat diabetes, hypertension, tooth decay and reproductive problems in traditional system of medicine around the world including Malaysia.

Objective: The objective of the present study is to determine the phytochemical analysis and antioxidant activity of the ethanolic extract of *S. torvum.* Further identification of poly-phenolic compounds and ascorbic acid by HPLC assay. To study the effect of ethanolic extract of *S. torvum* fruit on fasting blood glucose, lipid profile and hepatic enzymes. This investigation will also study the histopathology of pancreas and specific glucose regulating gene expression in streptozotocin induced diabetic Sprague Dawley rats.

Methods: Phytochemicals including polyphenols and ascorbic acid were determined by standard methods. Anti-oxidant activity was determined by DPPH free radical scavenging and FRAP assays. Acute toxicity study was done according to OECD guidelines. The antidiabetic effect of the herbal extract was studied in stertozotocin induced diabetic Sprague Dawley rats by studying the biochemical parameters (Fasting blood glucose, Lipid profile and Hepatic enzymes), body weight, food, water intake and histopathology of pancreas. Expressions of glucose transporter2 (slc2a2) and phosphoenolpyruvate carboxykinase (pck1) genes were determined by reverse transcription polymerase chain reaction (RT-PCR).

Results: Qualitative analysis of ethanol extract of *S. torvum* fruit showed the presence of reducing sugars, saponins, alkaloids, tannins, phenols and flavonoids. Total phenol and flavonoid contents were 16.4±0.06 mg GAE/g and 2.8±0.02 mg QE/g respectively. In DPPH free radical scavenging assay, the IC_{50} value of the extract was found to be 1.62± 0.03 mg/ml and the FRAP value was found to be 541.2±3.45 mg $FeSO_4$ E/g. The HPLC

analysis revealed presence of rutin, quercetin and ascorbic acid. Acute toxicity study results indicated that the toxic dose was 1800 mg/kg of plant extract. The ethanolic extract of *S. torvum* treated groups showed decreased fasting blood glucose, reduced serum cholesterol, triglycerides, low density lipoproteins, very low density lipoproteins and increased level of high density lipoproteins in STZ induced diabetic Sprague Dawley rats. In addition, the results also revealed that reduced levels of hepatic enzymes such as alanine aminotransferase (ALT) and aspartate aminotransferase (AST) in plant extract treated groups. Histopathological study of pancreas showed regeneration of β-cell of islets of Langerhans. Gene expression studies indicated lower expression *slc2a2* (glucose transporter2) and *pck1* (phosphoenolpyruvate carboxykinase) genes in *S. torvum* fruit extract treated animals as compared to diabetic control.

Conclusions: Antidiabetic effect of ethanolic extract of *S. torvum* fruit may be attributed to the antioxidant potential as evidenced by the significant regeneration of β cells of islets of Langerhans and also supported by the results of biochemical and gene expression studies. Further studies are required to investigate the molecular mechanism of antidiabetic potential of *S. torvum* fruit.

Keywords: Streptozotocin, Type 2 diabetes, Hypoglycaemic activity, Antioxidant, Gene expression.