An in vitro Adipogenic Potential and Glucose Uptake Stimulatory Effect of Betulinic Acid and Stigmasterol Isolated from Tetracera indica in 3T3-L1 Cell Line

ABSTRACT

Aerial parts of Tetracera indica Merr. (Dilleniaceae) are rich in betulinic acid and stigmasterol and traditionally used to treat diabetes. This study was aimed to evaluate an in vitro antidiabetic potential of betulinic acid and stigmasterol to ascertain whether they may contribute antidiabetic effect to T. indica. Initially, betulinic acid and stigmasterol were isolated from the most effective subfraction (ethyl acetate) and subjected to an in vitro antidiabetic investigation through adipogenesis and fluorescence glucose (2-NBDG) uptake assays using 3T3-L1 fibroblast. MTT viability assay was performed at 0.78 to 100 µg/mL for 48 h to determine the safe concentration. Both compounds were subjected to 2-NBDG uptake test on the differentiated adipocytes. The cells were treated in safe concentrations (25-100 µg/mL) as well as in different adipogenic cocktails, which were modified by the addition of compounds to be investigated and in the presence or absence of insulin (10 µM). Rosiglitazone (10 µM) was used as standard. Stems ethanol extract and its fractions (hexane and ethyl acetate), betulinic acid and stigmasterol were found safe at their highest concentration (100 µg/mL) by inhibiting cells well below their IC50 values viz. 18.60, 35.27, 21.40, 28.86 and 33.06%, respectively. Both betulinic acid and stigmasterol at the highest safe concentration (100 µg/mL) significantly ($p < 0.05$) induced adipogenesis like insulin, enhanced adipogenesis like rosiglitazone and exhibited glucose uptake activity. The present study demonstrates that both betulinic acid and stigmasterol possess an in vitro antidiabetic potential. However, in vivo antiglycemic study on these compounds and their chemical analogs are still warranted to ensure their therapeutic potential as safe antidiabetic agents.