Stevioside Potentiates Insulin Sensitivity by Elevating Insulin-Stimulated Glucose Uptake in 3T3-L1 Adipocytes

Nabilatul Hani Mohd Radzman1,*, Zainah Adam2, Siti Safura Jaapar1, Aishah Adam1 and Wan Iryani Wan Ismail1

1Faculty of Pharmacy, UiTM Puncak Alam, 42300 Bandar Puncak Alam, Selangor Darul Ehsan, Malaysia; 2Medical Technology Division, Nuclear Malaysia, Bangi, 43000 Kajang, Selangor Darul Ehsan, Malaysia; E-mail: nabilaradzman@gmail.com

Stevia rebaudiana Bertoni is a herb common to tropical and subtropical regions particularly Asia and South America. In countries like Malaysia, the sweet leaves of this plant have been used in daily cooking and as a form of alternative therapy by communities practicing folk medicines. The zero-calorie value of stevia leaves also provide a beneficial sweetening alternative to patients with metabolic syndromes like diabetes and obesity. A cell culture model of 3T3-L1 preadipocytes was implemented in this study to investigate the effects of stevioside, a major component extracted from the Stevia rebaudiana Bertoni plant on improving insulin sensitivity. 3T3-L1 preadipocytes were first differentiated to mature adipocytes prior to tests. The differentiation process was later confirmed by performing Oil-Red-O staining. The degree of insulin sensitivity was measured by performing counts via the radioactive 2-deoxyglucose uptake assay. A separate assay was done to estimate the optimum insulin concentration in the glucose uptake of the 3T3-L1 adipocytes. Cells treated with stevioside showed significant increase in glucose uptake at lower concentrations compared to a diabetic drug, rosiglitazone maleate at higher concentrations of the compound. The enhancement of glucose uptake was 2.34-fold (p<0.001) in the cells treated with 30µM stevioside. Stevioside was thus seen to elevate insulin-stimulated glucose uptake concomitant with potentially enhanced insulin signaling in the 3T3-L1 cell culture model.

Keywords: Stevia rebaudiana, stevioside, insulin, 2-deoxyglucose, glucose uptake, rosiglitazone.