

**UNIVERSITI TEKNOLOGI MARA**

*Azadirachta excelsa* AMELIORATES  
**HYPERGLYCAEMIA AND  
DIABETES-ASSOCIATED  
LEARNING AND MEMORY  
IMPAIRMENTS  
IN STREPTOZOTOCIN-INDUCED  
TYPE 1 DIABETIC RATS**

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## ABSTRACT

The decline in learning and memory functions manifested by diabetes mellitus is develops with the association of hyperglycaemia-induced oxidative stress. The current hypoglycaemic agent, including metformin causes many adverse effects that have raised the trend of traditional plant consumption in ameliorating diabetes. *Azadirachta excelsa* leaves extract causes the reduction of fasting blood glucose (FBG), yet its effect towards oxidative stress, the other biochemical and histological changes in the brain as well as the learning and memory functions remain to be analysed further. Quercetin, a phytochemical that can be found abundantly in plant kingdom may contributes to the improvement of the learning and memory functions. Hence, this study aimed to determine the potential of *A. excelsa* leaves extract in ameliorating diabetes and diabetes-associated learning and memory impairments. Metformin and quercetin were used as positive controls. Diabetic induction was conducted with one injection of 60 mg/kg body weight (bwt) of streptozotocin (STZ) among male Sprague-Dawley rats. Experimental animal consisted of the normal control (NC) and diabetic rats (FBG > 11.0 mmol/L). The diabetic rats were divided into the diabetic control (DC), metformin-treated diabetic (DMET), quercetin-treated diabetic (DQ) and *A. excelsa*-treated diabetic (DAE), with six animals per group (n=6). The treatments were administered through oral gavage once daily throughout the 8 weeks period. Upon the 8 weeks of the treatment period, the DC group showed a significant increment of the FBG level, but reduction in the insulin level as compared with the other groups. Meanwhile, the DMET, DQ and DAE manifested a significant reduction of FBG level. Interestingly, only DAE group had a significantly elevated serum insulin level as compared to the DC, DMET and DQ groups. The most significant amelioration of the brain parameters was observed in the DAE group. This included, the brain insulin, amylin, and SOD levels, the hippocampal neuron soma size in the CA1 and CA3 regions and the percentage of normal neuron in the CA1 and DG regions as well as the significant reduction in the AA:DHA ratio. Meanwhile, the DQ group showed a significantly increase percentage of normal neuron in the CA1 and DG regions with the significant reduction of the brain MDA and AA:DHA ratio. However, both treatments showed an improvement in both learning and memory functions. Although DMET group showed a similar effect to the DQ group, it only marked the improvement in the learning function. These analytical results reflect the synergetic effect of active compound presence in *A. excelsa* in ameliorating diabetes-associated learning and memory impairments to be better than metformin and quercetin.

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