

Terminalia bellirica stimulates the secretion and action of insulin and inhibits starch digestion and protein glycation in vitro.

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Abstract

Traditional plant treatments have been used throughout the world for the therapy of diabetes mellitus. The aim of the present study was to investigate the efficacy and mode of action of Terminalia bellirica used traditionally for the treatment of diabetes in India. T. bellirica aqueous extract stimulated basal insulin output and potentiated glucose-stimulated insulin secretion concentration-dependently in the clonal pancreatic beta-cell line, BRIN-BD11 ($P < 0.001$). The insulin-secretory activity of the plant extract was abolished in the absence of extracellular Ca^{2+} and by inhibitors of cellular Ca^{2+} uptake, diazoxide and verapamil ($P < 0.001$; $n = 8$). Furthermore, the extract did not increase insulin secretion in depolarised cells and did not further augment insulin secretion triggered by tolbutamide or glibenclamide. T. bellirica extract also displayed insulin-mimetic activity and enhanced insulin-stimulated glucose uptake in 3T3-L1 adipocytes by 300 %. At higher concentrations, the extract also produced a 10-50 % ($P < 0.001$) decrease in starch digestion in vitro and inhibited protein glycation ($P < 0.001$). The present study has revealed that components in T. bellirica extract stimulate insulin secretion, enhance insulin action and inhibit both protein glycation and starch digestion. The former actions are dependent on the active principle(s) in the plant being absorbed intact. Future work assessing the use of T. bellirica as a dietary adjunct or as a source of active anti-diabetic agents may provide new opportunities for the treatment of diabetes.

