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Flavonoids from *Tetracera indica* Merr. induce adipogenesis and exert glucose uptake activities in 3T3-L1 adipocyte cells (Article)

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Abstract

Background: *Tetracera indica* Merr. (Family: Dilleniaceae), known to the Malay as 'Mempelas paya', is one of the medicinal plants used in the treatment of diabetes in Malaysia. However, no proper scientific study has been carried out to verify the traditional claim of *T. indica* as an antidiabetic agent. Hence, the aims of the present study were to determine the in vitro antidiabetic potential of the *T. indica* stems ethanol extract, subfractions and isolated compounds. **Methods:** The ethanol extract and its subfractions, and isolated compounds from *T. indica* stems were subjected to cytotoxicity test using MTT viability assay on 3T3-L1 pre-adipocytes. Then, the test groups were subjected to the in vitro antidiabetic investigation using 3T3-L1 pre-adipocytes and differentiated adipocytes to determine the insulin-like and insulin sensitizing activities. Rosiglitazone was used as a standard antidiabetic agent. All compounds were also subjected to fluorescence glucose (2-NBDG) uptake test on differentiated adipocytes. Test solutions were introduced to the cells in different safe concentrations 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. Isolation of bioactive compounds from the most effective subfraction (ethyl acetate) was performed through repeated silica gel and sephadex LH-20 column chromatographies and their structures were elucidated through ¹H- and ¹³C-NMR spectroscopy. **Results:** Four monoflavonoids, namely, wogonin, norwogonin, quercetin and techtochrysin were isolated from the *T. indica* stems ethanol extract. Wogonin, norwogonin and techtochrysin induced significant ($P < 0.05$) adipogenesis like insulin and enhanced adipogenesis like rosiglitazone. Wogonin and norwogonin also exhibited significant ($P < 0.05$) glucose uptake activity. **Conclusion:** The present study demonstrated that the flavonoids isolated from the *T. indica* stems possess antidiabetic potential revealing insulin-like and insulin-sensitizing effects which were significant among the compounds. This also rationalizes the traditional use of *T. indica* in the management of diabetes in Malaysia. © 2017 The Author(s).

Reaxys Database Information

Author keywords

2-NBDG glucose uptake activity 3T3-L1 preadipocyte cells Adipogenesis Flavonoids Insulin like activity
Insulin sensitizing activity *Tetracera indica* Merr.

Indexed keywords

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EMTREE drug terms: acetic acid ethyl ester alcohol antidiabetic agent flavonoid insulin norwogonin
plant extract quercetin rosiglitazone sephadex silica gel tectochrysin
Tetracera indica extract unclassified drug wogonin antidiabetic agent flavonoid
glucose insulin plant extract

EMTREE medical terms: 3T3 L1 cell line adipocyte cell line adipogenesis animal cell antidiabetic activity
Article carbon nuclear magnetic resonance cell differentiation cell viability assay
column chromatography controlled study cytotoxicity test Dilleniaceae
drug determination drug effect drug efficacy drug mechanism fluorescence
glucose transport in vitro study Malaysia mouse MTT assay nonhuman
plant stem proton nuclear magnetic resonance Tetracera indica 3T3-L1 cell line
adipocyte adipogenesis animal chemistry cytology drug effects
isolation and purification metabolism transport at the cellular level

MeSH: 3T3-L1 Cells Adipocytes Adipogenesis Animals Biological Transport Dilleniaceae
Flavonoids Glucose Hypoglycemic Agents Insulin Mice Plant Extracts

Chemicals and CAS Registry Numbers:

acetic acid ethyl ester, 141-78-6; alcohol, 64-17-5; insulin, 9004-10-8; quercetin, 117-39-5; rosiglitazone, 122320-73-4, 155141-29-0; sephadex, 11081-40-6, 12774-36-6, 37224-29-6, 9014-76-0, 9041-35-4, 9041-36-5, 9048-71-9, 9050-68-4, 9050-94-6; silica gel, 63231-67-4; tectochrysin, 520-28-5; wogonin, 632-85-9; glucose, 50-99-7, 84778-64-3;

Flavonoids; Glucose; Hypoglycemic Agents; Insulin; Plant Extracts

Manufacturers:

Drug manufacturer:

Sigma Aldrich, United States

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