

**UNIVERSITI TEKNOLOGI MARA**

**PHYTOCHEMICAL STUDY OF  
MALAYSIAN *UNCARIA CORDATA*  
VAR. *FERRUGINEA* (BL.) RIDSD  
AND ITS ANTI-HYPERGLYCEMIC  
POTENTIAL**

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Thesis submitted in fulfillment  
of the requirements for the degree of  
**Master of Science**

**Faculty of Applied Sciences**

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## AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is result of my own work, unless otherwise indicated or acknowledge as referenced work. This thesis has not been submitted to any other academic institution, or non-academic institution for any other degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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## ABSTRACT

In this study, the chemical constituents and the *in vitro* anti-hyperglycemic potential of Malaysian *Uncaria cordata* var. *ferruginea* were studied. The phytochemical study of this plant led to the isolation of ten compounds comprising four different classes of natural products including three phenolic acids, two coumarins, three flavonoids, one terpene and one iridoid glycoside. All of the isolated compounds were elucidated as 2-hydroxybenzoic acid (salicylic acid), 3,4-dihydroxybenzoic acid, 2,4-dihydroxybenzoic acid, 7-hydroxy-6-methoxycoumarin (scopoletin), 3,4-dihydroxy-7-methoxycoumarin, quercetin, kaempferol, taxifolin, loganin and  $\beta$ -sitosterol. They were isolated by applying various chromatographic techniques including vacuum liquid chromatography, column chromatography, preparative thin layer chromatography as well as recycling preparative High Performance Liquid Chromatography (HPLC) while the structure elucidation of compounds were accomplished with the aid of one-dimensional (1D) and two-dimensional (2D) Nuclear Magnetic Resonance (NMR) spectral data. Further characterization of these compounds were performed with the aid of various spectroscopic methods such as Ultraviolet-Visible spectroscopy (UV-Vis), Fourier Transform Infrared (FTIR) spectroscopy and mass spectrometry (MS). In the evaluation of its *in vitro* anti-hyperglycemic potential, the crude extract, fractions and selected compounds were assayed for  $\alpha$ -glucosidase inhibitory activity. The crude methanolic stem extract of this plant exhibited high percentage of  $\alpha$ -glucosidase inhibition (87.7%), the acetone fraction exhibited strong inhibition (89.2%) while dichloromethane fraction demonstrated a moderate inhibition (75.3%) against  $\alpha$ -glucosidase enzyme at concentration of 1 mg/ml. The  $IC_{50}$  values of both fractions were found to be much lower than the standard acarbose suggesting the presence of potential  $\alpha$ -glucosidase inhibitors. All selected compounds including 2,4-dihydroxybenzoic acid, quercetin and loganin isolated from the acetone fraction were also assayed for  $\alpha$ -glucosidase inhibitory properties and their percentage inhibition against the enzyme measured at concentration of 1 mg/ml. 2,4-Dihydroxybenzoic acid and quercetin showed strong inhibitory effect against  $\alpha$ -glucosidase enzyme with  $IC_{50}$  values of 549  $\mu$ g/ml (3.56 mM) and 556  $\mu$ g/ml (1.84 mM), respectively, compared to the standard acarbose ( $IC_{50}$  580  $\mu$ g/ml or 0.89 mM) whereas the iridoid glycoside loganin showed only weak  $\alpha$ -glucosidase inhibition (44.9%). Scopoletin, a major compound isolated from dichloromethane fraction also displayed a weak activity of  $\alpha$ -glucosidase inhibition (34.5%). In short, a total of ten chemical constituents were isolated from the stem and flower extracts of Malaysian *Uncaria cordata* var. *ferruginea*. Among them, three compounds were reported for the first time from the genus. This is also the first report on the non-alkaloidal constituents of the plant. Their *in vitro* anti-hyperglycemic potential have provided some scientific evidence on the traditional use of the plant for diabetes.

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