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

February 2016
CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 1st December 2015 to conduct the final examination of Nur Hakimah Bte Abdullah on her Master of Science thesis entitled “Phytochemical Study of Malaysian Uncaria cordata var. ferruginea (Bl.) Ridsd and Its Anti-hyperglycemic Potential” in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The panel of Examiners recommends that the student be awarded the relevant degree. The panel of Examiners was as follows:

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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 β-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 α-glucosidase inhibitory activity. The crude methanolic stem extract of this plant exhibited high percentage of α-glucosidase inhibition (87.7%), the acetone fraction exhibited strong inhibition (89.2%) while dichloromethane fraction demonstrated a moderate inhibition (75.3%) against α-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 α-glucosidase inhibitors. All selected compounds including 2,4-dihydroxybenzoic acid, quercetin and loganin isolated from the acetone fraction were also assayed for α-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 α-glucosidase enzyme with IC$_{50}$ values of 549 μg/ml (3.56 mM) and 556 μg/ml (1.84 mM), respectively, compared to the standard acarbose (IC$_{50}$ 580 μg/ml or 0.89 mM) whereas the iridoid glycoside loganin showed only weak α-glucosidase inhibition (44.9%). Scopoletin, a major compound isolated from dichloromethane fraction also displayed a weak activity of α-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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