UNIVERSITI TEKNOLOGI MARA

ISOLATION AND CHARACTERIZATION OF APIGENIN 6,8-DI-*C*-GLYCOSIDES DERIVATIVES FROM *Ficus deltoidea* var. *trengganuensis*

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ABSTRACT

Ficus deltoidea belongs to the family of Moraceae and locally known as "mas cotek". Mas cotek is traditionally used to treat diabetes and many products have been sold in the market especially as herbal tea products. To date, only four compounds were isolated and characterized from *Ficus deltoidea* even though there were many scientific reports on its biological activities. A list of identified compounds published using mass spectrometry (MS) cannot determine the exact structure of pentose sugars and its stereochemistry. Most of the reports did not state variety of *Ficus deltoidea* used. Correct identification of compounds especially to *Ficus deltoidea* specific varieties is crucial for reproducibility and consistency of its biological activity and as quality control for mas cotek-based products. Therefore, this study is conducted to isolate and characterize chemical constituents in one of *Ficus deltoidea* variety namely *trengganuensis*. The dried leaves were soaked in methanol and the profile of the crude extract was developed using ultra high performance liquid chromatography (UHPLC) before introduced to resin column to remove free sugar and fractionated using preparative liquid chromatography (PLC). Purification of fractions containing apigenin 6,8-di-*C*-glycosides derivatives was a challenging task as they had very close retention times. The isolation was successfully accomplished using repeated preparative recycling high performance liquid chromatography (PRHPLC) in isocratic condition. The structures of these pure compounds were elucidated by using ultraviolet (UV), nuclear magnetic resonance (NMR) and MS. This exhaustive chromatographic procedures led to the isolation of nine apigenin 6,8-di-*C*-glycosides derivatives, namely vicenin-2 (**65**), vicenin-1 (**66**), schaftoside (**53**), isoschaftoside (**54**), apigenin 6-*C*-*β*-L-arabinopyranosyl-8-*C*-*α*-L-arabinopyranoside (**67**), apigenin 6,8-di-*C*-*α*-L-arabinopyranoside (**68**), apigenin 6-*C*-*β*-D-xylopyranosyl-8-*C*-*α*-L-arabinopyranoside (**69**), apigenin 6,8-di-*C*-*β*-D-xylopyranoside (**70**) and apigenin 6-*C*-*α*-L-arabinopyranosyl-8-*C*-*β*-D-xylopyranoside (**71**). All compounds are apigenin as aglycone and have two sugar moieties at C-6 and C-8 of apigenin. The sugar can be glucose, xylose or arabinose. The configuration of glucose and xylose often exist as D sugar while arabinose as L sugar. They have interconverting of *α* and *β* positions at C-6 and C-8. Some of them are isomers. All compounds are *C*-glycosides as their anomeric carbon fall in the range between 70 to 80 ppm. This is the first phytochemical study that reported specifically to variety specific of *Ficus deltoidea* namely *Ficus deltoidea* var. *trengganuensis*. The isolated compounds were reported for the first time in the family of Moraceae except **53** and **54**, which were previously isolated from *Ficus carica*. These isolated compounds were unique as they only present in genus *Ficus*.

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CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

1.1.1 Primary and Secondary Metabolites from Plants

There are two types of plant metabolites namely primary and secondary metabolites. Primary metabolites are produced from primary metabolism processes such as photosynthesis and respiration process. Primary metabolites are the most important source for plant growth, development as well as reproduction. The growth of the plant will be retarded and eventually the plant cannot survive and die in the absence of primary metabolites. Examples of primary metabolites are proteins, lipids and carbohydrates. Primary metabolites are the building blocks of secondary metabolites. Secondary metabolites are commonly known as natural products and produced from secondary metabolism. Natural products from plants are commonly referred as phytochemicals. They do not involve directly in the fundamental processes. They are produced as plant survival such as for defence mechanism or protect against insects or pests and adaptation to the environment changes. Besides that, secondary metabolite can also perform other functions such as giving colour to flowers as well as giving fragrance to assist in pollination. Examples of secondary metabolites are alkaloids, flavonoids, terpenes, saponins and tannins (Samy, Sugumaran, & Lee, 2005).

1.1.2 Medicinal Plants in Malaysia

Traditional medicine has been used since long time ago by primitive people for various health complaints before the introduction of modern medicine. Plants are traditionally used to treat various diseases and for health general well-being. The treatment involved the use of herbs, ritual or both and mostly relied on individual practitioners (Opoku, Addai-Mensah, & Wiafe, 2015). The effectiveness of traditional medicine depends on the beliefs, theories and practices without scientific evidence.