UNIVERSITI TEKNOLOGI MARA

CHEMICAL CONSTITUENTS ISOLATED FROM *Pereskia bleo* EXTRACTS AND THEIR ANTIOXIDANT AND ANTIBACTERIAL ACTIVITIES

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ABSTRACT

Pereskia bleo is a popular medicinal plant used traditionally to treat cancer-related diseases, hypertension, diabetes, and various illnesses. Previous studies reported various interesting biological activities of different *Pereskia* species, especially cytotoxic activity. Based on ethnobotany uses of *Pereskia* species and some earlier data on its biological activities, there should be a unique structure of biologically active compounds that is responsible for its popularity and results that have been reported. Several known compounds have been isolated from previous studies. However, only one flavonoid, Vitexin, was reported in 2012. More work must be carried out on the isolation of pure compounds from this genus. This study aimed to isolate chemical compounds and elucidate their chemical structures using modern spectroscopic methods such as Liquid chromatography-mass spectroscopy (LC-MS), Nuclear magnetic resonance (NMR) spectroscopy, and Infrared (IR) spectroscopy. In addition, selected pure compounds and different solvent extracts were used to determine the antibacterial and antioxidant activities based on 1,2-diphynyl-2-pricrylhydrazyl (DPPH), and minimal inhibitory concentrations (MIC) and minimum bacterial concentration (MBC) assays, respectively. In this study, four types of microorganisms were tested, namely *Escherichia coli* **ATCC 10535** (EC), *Pseudomonas aeruginos* **ATCC 9027** (PA), *Staphylococcus aureus* **ATCC 29737** (SA), and *Streptococcus pyogenes* **ATCC 19615** (SP). For the phytochemical study on the stem extract, one new chalcone derivative, 4-Hydroxy-2,3,6-trimethoxy chalcone **(PB 2)** and one known fatty acid, (Z)-16-methoxy-16-oxohexadec-7-enoic **(PB 1)** were elucidated through the extensive use of 1D and 2D NMR as well as LCMS. Two known phytosterols identified as beta-sitosterol (**PB 3**) and stigmasterol (**PB 5**) and one flavone derivative, namely 5,7-dihydroxy-6-methoxy flavone (Oroxylin A) (**PB 6**), were found in the acetone stem extract. Besides, beta-sitosterol (**PB 4**) was also isolated from the hexane leaves extract. The methanolic leaf crude extract showed the most potent free radical scavenging activity, while all stem crude extracts showed intermediate antioxidant activity. For antibacterial activity, all chloroform and methanol extracts from its leaves and stem and acetone stem extract showed strong antibacterial activity against all tested bacteria. The antibacterial activity could be contributed by **PB 2**, **PB 5,** and **PB 6**, where the MBC value is less than 500 µg/mL. The result of this study is a significant contribution toward further understanding the chemotaxonomy of this genus and the Cactaceae family. The four bacteria used in this study are all related to food spoilage and food-borne diseases. Therefore, this study suggests that certain *P. bleo* could be used as a natural preservative in food to replace chemical preservatives.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

Medicine's herbal folk knowledge systems have given rise to some significant drugs still in use today. Nowadays, the search for a new molecule has taken a slightly different route where ethnopharmacological data are being used as a guide for chemists across the globe toward various sources and classes of compounds (Cordell *et al.*, 1991). Ethnopharmacological data are the standard and convenient ways for finding biologically active compounds from plants, in which the preference of a plant regards prior knowledge on the folk medicine use of the plant. Generally, it was known as ethnomedical data, providing substantially higher chances of finding active plants than the random approach (Cordell *et al.*, 1991).

Most pharmaceutical agents originated by screening natural products from organisms, plants, and marine. The variety of compound structures derived from natural products offers valuable sources of novel lead compounds for newly discovered therapeutic targets (Harvey, 1999). For example, the discovery of penicillin has changed global existence. Moreover, the statistics according to the utilization of natural products as drugs are now popular and have been frequently presented and discussed.

About 250,000 plant species live worldwide, and about 60 % exist in tropical rainforests. The resources of plants in Malaysia contain about 15,000 species of higher plants. Only about 1,000 plants have undergone simple chemical screening, and fewer have been subjected to thorough pharmacological or chemical studies (Goh *et al.*, 2010). As Malaysia has a great diversity of flora that could be better studied and explored, we would expect various secondary metabolites to be present in these plants. In Malaysia, Malays use Jamu medicine, Indians use Ayurvedic medicine, and the Chinese use Traditional Chinese medicine (TCM). For example, the *Pereskia* genus, which consists of 25 tropical species and varieties of leafy cacti, is claimed to have many ethnobotany uses (Kazama *et al.*, 2012; Abd Malek *et al.*, 2009; Pinto *et al.*, 2015; de Almeida *et al.*, 2016; Dias *et al.*, 2009) as summarized in Table 1.1.