Belalai Gajah

(CLINACANTHUS NUTANS)

SCIENTIFIC EVIDENCE OF CANCER PREVENTION

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PREFACE

This book contains information about the traditional used and phytochemicals of belalai gajah (*Clinacanthus nutans*). This report had scientifically supported the testimonies of Malaysian who claimed that C. *nutans* possesses antitumour effects and has saved many cancer patients. The uses of plant in traditional medicine and current studies had been discussed. Single compounds had been isolated by purification using chromatographic techniques. Apart from that, a brief review of concept between chemical composition and biological activities is also described in this book.

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CHAPTER 1
INTRODUCTION

Natural products have a vital role as medicine and prevention of diseases. Natural product is a chemical compound produced by the organisms such as a plant, a fungus, a bacterial species or even marine creatures found in the nature that are produced by the pathways of primary and secondary metabolism (Ganesan 2008). Natural products have been the major sources of chemical diversity in pharmaceutical discovery over the past centuries (Baker et al. 2007). In addition, natural product also has vital role in pharmacological area and commercial industries, which provide a lot of health benefits and medicinal products like antibacterial, anti-hepatotoxic, nutraceuticals, flavour and food additives (Catalani et al. 2016).

Various studies had been conducted by using plants and animals in order to know their biological effects. Crude extracts were found to have healing power in reducing diseases. The biological effect of crude extracts may lead to the discovery of new bioactive compounds and contribute to drugs development (Patwardhan, Vaidya, and Chorghade 2004). However, based on previous reports, very little effort has been made to establish the scientific basis of traditional medicine and develop the availability of the plants into useful and valuable pharmaceutical products (Yuan et al. 2016).

According to the World Health Organization (WHO), around 80% of the world population in the developing countries use plants as a source for the treatment of various diseases and ailments such as cancer treatment, anti-inflammatory, malaria and other chronic diseases such as

cardiovascular, heart diseases and hypertension (Yahaya et al. 2015). The investigations of bioactive natural products were mainly concerned with discovering bioactive constituents. A research on isolation and characterisation of pharmacologically active compounds from plants continues until today.

Plant secondary metabolites are derived biosynthetically from plant primary metabolites (e.g., carbohydrates, amino acids, and lipids) (Gulfraz et al. 2004). Plants produce primary metabolites as a growth function, and secondary metabolites to protect the plant (Irchhaiya et al. 2015). Secondary metabolites can be categorised into three main groups according to their biosynthetic origin, which are terpenes, nitrogen-containing alkaloids and phenolic compounds. They act as defence chemicals and do not cause harmful effect to the plants (Kabera et al. 2014). Terpenes or isoprenoids are the largest family of natural products and possess at least one 5-carbon (C5) isoprene unit. Steroids, carotenoids and gallic acid are some of the members (Irchhaiya et al. 2015). The second largest secondary metabolites group is nitrogen-containing alkaloids, which is a structurally diverse group of compounds and commonly distinguished from amines. Other than that, most of them have a heterocyclic nitrogenous rings or ring system (Kabera et al. 2014, Fong 2015). The third largest group is the phenolic compounds, whereby the constituents are synthesised by fruits, vegetables, teas, cocoa and other plants. They are characterised by having at least one aromatic ring bearing one or more hydroxyl groups, which can undergo esterification, methylation and other reactions. According to Kabera et al. (2014), phenolic compound can be divided into four main phenolic groups; with one aromatic ring, with two aromatic ring, quinones and polymers. (e.g. Phenolic acids, flavonoids, stilbenes, coumarins, quinones, lignans, curcuminoids and tannins).

All these compounds have their own therapeutic effects and possess significant pharmacological activities. The information on medicinal plants helps researcher in providing