

1.0 INTRODUCTION

The total number of plant species in the world is estimated between 300,000 and 500,000. Of these, approximately 250,000 have been identified and classified (Frusciante *et al.*, 2000) and almost 35,000 to 70,000 species are used for medicinal purposes all over the world (ICS-UNIDO, 2006). Medicinal plants are the richest bio-resource of drugs of traditional systems of medicine, modern medicines, chemical entities for synthetic drug and pharmaceutical intermediate (Hammer *et al.*, 1999). They continue to be important to people who do not have access to modern medicines and moreover modern pharmaceuticals rely heavily on the same active principle, be it natural or synthetic. At least 6,500 medicinal plant species were reported in Asia, which is one of the largest biodiversity regions of the world. More than 1,200 species have been identified as medicinal plants in Malaysia (Chang *et al.*, 2000).

A number of interesting outcomes were found with the use of mixtures of natural products to treat diseases, most notably the synergistic effects and pharmacological application of plant extracts (Gibbons, 2003). The medicinal value of plants are based on some chemical substances that produce a definite physiological action on the human body and the most important bioactive compounds of plants are alkaloids, flavanoids, phenolic compounds and tannins (Edeoga *et al.*, 2005). There is a long history of medicinal use of plants in Southeast Asian countries, some of which have proved to be useful to humans as pharmaceuticals. This area therefore is a most promising site for discovery of novel biologically-active substances from its flora. (Houghton *et al.*, 2005).

Sinusitis can be defined as an acute or chronic inflammation of the sinuses. Sinusitis is very often a sequela of an acute respiratory tract infection caused by normal oropharyngeal flora consisting of aerobic and anaerobic bacteria (Socransky and Manganiello, 1971). Sinusitis can be classified into acute and chronic sinusitis. In acute sinusitis, the common isolated bacteria were *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis* (Brook *et. al.*, 1996). While in the chronic sinusitis, *Staphylococcus aureus* commonly predominate. Nevertheless, it is still a topic of controversy whether the pathogenesis of chronic infection is due to bacteria or an inflammatory process and bacteria presence is secondary. One of the most potent inflammatory mediators are free radicals that can be neutralized by antioxidants.

There are two types of plants which are of interest in this research. The first plant is *Ervatamia coronaria*. *Ervatamia coronaria* is also known as *Tabernaemontana divaricata*. *Tabernaemontana* is a genus of 100-110 species of flowering plants in the family *Apocynaceae*. The genus was named after the birthplace of its discoverer, J. Th. Mueller, Bergzabern, and Bergzabern which was then latinized into *Tabernaemontana*. Nearly 100 species of this genus can be found and widely distributed in tropical parts of the world, including Malaysia, India, Brazil, Egypt, Sri Lanka and Thailand. *Ervatamia coronaria* was first described by Linnaeus in 1753 (Van Beek *et. al.*, 1984).

To date, not many scientific studies involving sinusitis have been carried out on *Ervatamia coronaria* plant from Apocynaceae family. The *Ervatamia coronaria* has been used as traditional medicine to treat sinusitis. It is applied by application through the nose

followed by deep inhaling. This is to ensure and enhance an intimate contact with any open wound in the nasal cavity, simultaneously killing bacteria present at that site. At the same time the body will react automatically by violent sneezing, liberating out most of the bacteria. Although it has not been proven scientifically, feedback from many patients suggest antimicrobial activity. Apart from antimicrobial activity, not many researches have been carried out regarding antioxidant activity of this plant. Therefore systematic scientific investigation on the bioactivities of this plant is very much needed.

Another plant which is of interest in this research is *Tinospora crispa* from the family Menispermaceae. The Filipinos and Malays consider this plant as a universal medicine. It is the most popular among the local medicinal plants. This plant is rich in flavonoids (amongst them is apigenin). This plant is also an effective traditional remedy for the treatment of tropical ulcers. In Thailand, *Tinospora crispa* is one of the ingredients in Thai folk remedies for maintaining good health. A decoction of the stems, leaves and roots is used to treat fever, cholera, diabetes, rheumatism and snake-bites. In addition, *Tinospora crispa* has also been used traditionally to treat rheumatism and internal inflammation (Burkill, 1996) associated with oxidative stress. *Tinospora crispa* has also been demonstrated to possess antibacterial properties (Sulaiman *et al.*, 2008), nevertheless scientific research of its antimicrobial potential is very few.

Systematic research on *Ervatamia coronaria* and *Tinospora crispa* to evaluate the antimicrobial and antioxidant properties through bioassays and followed by chemical

investigations to identify compounds would be a good area of research. The findings from this work may add to the overall value of the medicinal potential of these plants.

1.1 Objectives of Study

The main objectives of this study are as follows:

- i. To evaluate antioxidant potentials of *Ervatamia coronaria* and *Tinospora crispa* using various antioxidant assays.
- ii. To evaluate antimicrobial activity of *Ervatamia coronaria* and *Tinospora crispa* against sinusitis-causing microorganisms.
- iii. To analyze and identify chemical constituents of *Ervatamia coronaria* and *Tinospora crispa* using Thin Layer Chromatography (TLC) and Liquid Chromatography Mass Spectrometry (LCMS)