

**Phytochemical Analysis of *Piper betle* Leaves Extracts using
Fourier Transform Infrared Spectroscopy (FTIR) and
Gas Chromatography Mass Spectrometry (GC-MS)**

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ABSTRACT

Piper betle is known as a medicinal plant or herb serves as lead compounds for drug discovery and design. *Piper betle* may have various phytochemicals which lead to different biological activities used to treat various ailments. The choice of extraction solvents itself may affect the extractable components in the leaves of *Piper betle*. Therefore, the present study investigates the efficiency of various solvent extracts and the characterization of the bioactive constituents present in the leaf extracts of *Piper betle* using FTIR and GC-MS. The diluted crude extracts were scanned in the wavelength ranging from 4000-400 cm^{-1} by using Perkin Elmer Spectrophotometer and the characteristic peaks were detected. For GC-MS analysis, the diluted crude extracts filtered in ash less filter paper with 4 g sodium sulphate and the extract is concentrated to 1 ml by bubbling nitrogen into the solution. The compound detection employed the NIST Version 2.0 in Year 2005 library. The FTIR spectrum confirmed the presence of phenols, alcohols, alkanes, alkyl halides, carboxylic acids, aromatics, nitro compounds and amines in the three different extracts. The results of the GC-MS analysis provide different peaks determining the presence of phytochemical compounds with different therapeutic activities. There were 15 major compounds identified in the ethanolic leaves extract, followed by chloroform leaves extract (13 compounds) and the least phytochemicals found in the acetone leaves extract (10 compounds). In addition, the most compound found in ethanolic leaves extract was Caryophyllene (25.20%), acetone leaves extract was α -Phellandrene (7.20%) while in chloroform leaves extract was Humulane-1,6-dien-3-ol (6.63%). Thus, the result of this study will make a way for the production of herbal medicines for various ailments by using *Piper betle* leaves and lead to further discovery of new drugs for modern treatment.

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CHAPTER 1

INTRODUCTION

1.1 **Background Study**

Medicinal plants or herbs are known as a potential source of natural remedies (Acharya and Shrivastava, 2008). The herbal plants can be eaten, cooked or used as herbal cures for various ailments (Akpanabiatu et al., 2005). In many Asian practices, the traditional healers use medicinal plants to cure common ailments such as fever, cough and diabetes (Gabriel *et al.*, 2007; Odey *et al.*, 2012). This is because herbal plants are more pleasant compared to modern medicines as they provide cheaper cost and safe as alternative source of drugs (Ashok *et al.*, 2014). Besides, it is believed that Asians tend to self-medication with the plant medicines because of the ready availability and affordability of plants compared to the commercial drugs.

One of the most common herbal plants used in Asians is *Piper betle*. This plant can be utilised in herbal remedies to treat various ailments and sustained overall good health (Pradhan *et al.*, 2013). The *Piper betle* is known as an evergreen plant and perennial creeper that has a heart-shaped (Varier, 1995). In Malaysia, it is called as ‘Sirih’ which people commonly eat by chewing together with areca nut, slaked lime, cardamom and clove (Walter and Sofia, 2007). The leaves of *Piper betle* have a significant symbol in human life cycle including culture (as Tepak Sireh in Malay wedding traditions), religious ceremonies and social relationship where it is relevant even in modern days (Guha, 2006). Asian countries (e.g.: Malaysia, India, Thailand, Indonesia, Vietnam, etc.) are known as the best place for cultivation of *Piper betle* plant as they have tropical rain forest which provide cool shade, considerable hot and humid season over the year and an adequate supply of soil moisture (Balasubrahmanyam and Rawat, 1990).

The *betle* leaf from Piperaceae family has many phytochemical compounds which leads to have various therapeutic properties including anti-microbial (Nagori *et al.*,