EFFECT OF USING DIFFERENT DRYING METHODS ON THE CHEMICAL COMPOSITION (GALLIC ACID) IN THE *PIPER BETLE* LEAVES EXTRACT

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ABSTRACT

Piper betle or widely known as *Daun Sireh* has been widely used traditionally to treat various disease since ancient time. Due to the presence of numerous bioactive compounds in the leaves of the *Piper betle*, which are utilised in many commercial products in Malaysia, they can serve as a flavouring, folk medicine, aromatherapy, dental, and oral products. The processing parameter in extraction method is crucial to obtain its bioactive compound which contribute to its therapeutic activities. Therefore, this study was conducted to determine the effect of different drying method on the chemical composition which is the total amount of Gallic acid. The drying methods that were used in this study were sun drying and oven drying at different temperature which are 40°C, 60°C and 80°C. The drying process involves applying heat to the product, which could cause essential bioactive compound in the herbs to degrade and disintegrate. The extraction of dried *Piper betle* leaves was prepared using Soxhlet apparatus and the solvent used for extraction was aqueous only. The determination and quantification of Gallic acid was implemented by using High Performance Liquid Chromatography (HPLC). The highest percentage extraction yield and also the highest value of Gallic acid was exhibited by oven drying method at temperature 80°C with the value of 10.52% and 48.83%. In conclusion, from the result, the pre-treatment using oven drying (80°C), Soxhlet techniques using aqueous as a solvent was chosen as the best drying method to extract Gallic acid from *Piper betle* leaves and has a potential to be developed as future herbal-based products.

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CHAPTER ONE
BACKGROUND

1.1 Introduction

The plant known as betel, or *Piper betle L.*, is a part of the *Piperacea* family. It is a fragrant creeper with alternating, shiny, long stalked leaves that have a pointy tip. Locally known as *Sirih*, this plant is native to the central and eastern regions of peninsular Malaysia. It is now a significant commercial crop farmed in Sri Lanka, Bangladesh, and India (Pin et al., 2009). It is connected to numerous social and religious practices in India. The leaves of betel, which are edible, are frequently chewed together with areca nuts, lime, and tobacco. Traditional medicine employs the extract of betel leaves to treat throat irritation, reduce coughing and indigestion, freshen breath, and treat wounds with antibacterial properties (Tee et al., 2012). The presence of several bioactive chemicals or bio constituents throughout the plant contributes for its ability to treat disease. The active components of *Piper betle's* bio constituents include tannins, flavonoids (quercetin), eugenol, hydroxychavicol, and chavibetol. Numerous pharmacological characteristics of *Piper betle* have been reported, including antibacterial, antifungal, antioxidant, antidiabetic, and anticancer effects (Azahar et al.,2020).

Figure 1: Betel leaves with areca nuts, lime, and tobacco

The process of drying—also referred to as dehydration—removes moisture from the product. By removing the water from the product, potential microbial contamination and phytochemical degradation are avoided. The majority of drying methods use heat to eliminate moisture from the items. The increase in drying temperature shortens the

drying time by elevating the drying rate. High temperature usage, however, is frequently threatened the product quality loss or degradation. The preservation of the phytochemicals, which are typically heat sensitive, is the main factor to take into account when drying herbs like betel leaves. It's because herbs' positive bioactivity is facilitated by their phytochemical content (Pin et al., 2009). Other than that, although sun drying is common, extended direct exposure to the sun's rays causes undesirable changes in colour, texture, and flavour as well as contamination with sand, mud, and foreign objects (Balasubramanian et al., 2010).

This study focused on the effects of different drying methods on the extraction of betel leaves by drying with sunlight and oven with different temperatures. Then, the content of bioactive compounds in the dried leaves was determined using high-performance liquid chromatography (HPLC). To extract the sample from dried betel leaves, we need to apply the Soxhlet Extraction method and use aqueous as a solvent. This method is widely used as it reduces the consumption amount of the solvent we used in the procedure as the solvent is continuously cycled through the process. At the end of the process, the extracted oil or sample can obtain from the dried betel leaves.

1.2 Literature Review

1.2.1 What is Soxhlet extraction?

In 1879, to determine milk fat, German agricultural chemist, Franz Ritter von Soxhlet invented the Soxhlet laboratory extractor. Every invention is said to have some uncertainties, and this invention's use of a constant level siphon to transfer the extract back to the solvent flask after each extraction cycle adds to the confusion. Solid-liquid extraction, which is used to make tea and perfumes, has been used for as long as there has been recorded history. Midway through the 19th century, this procedure was also referred to by the term's maceration, infusion, decoction, lixiviation, and displacement. His innovation's creation was spurred by a need to quantify the extraction process in order to use it to quantitatively estimate the fat content of organic matter (Jensen, 2007).

The Soxhlet extractor setup consists of a round bottom flask, siphon tube, distillation path, expansion adapter, condenser, cooling water inlet, cooling water outlet, heat source and thimble (Gopalasatheeskumar, 2018). This technique involves placing