



COMPARATIVE STUDY BETWEEN HYDRODISTILLATION AND MICROWAVE-ASSISTED HYDRODISTILLATION FOR EXTRACTION OF CINNAMOMUM CASSIA OIL

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ABSTRACT

Microwave assisted hydrodistillation (MAHD) is an advanced technology extraction method that came up through the incorporation of microwave irradiation into the conventional method, hydrodistillation (HD). In this research, both MAHD and HD methods have been compared and evaluated for their effectiveness in the extraction of essential oil from (cinnamon) barks. The effect of various parameters such as microwave power level (200W, 225W, 250W and 275W), water to raw material ration (6:1, 8:1 and 10:1) and extraction time (30 min, 60 min, 90 min, 120 min, 150 min and 180 min) on the yield of extraction and its major constituents were investigated and compared accordingly between MAHD and HD. At the optimum parameters of microwave power, 250W, water to raw material ratio of 8:1 and extraction time of 90 min, the yield obtained was 2.55% and 1.89% for MAHD and HD respectively. Gas Chromatography/Mass Spectrometric (GC-MS) used to further analyse the effect of both extraction methods by evaluating the content of its main constituents which is trans-cinnamaldehyde and oxygenated compounds. Results revealed that MAHD method possesses highly desirable features than HD and could serve as an efficient and convenient alternative to HD, especially in terms of its shorter extraction time, as well as the potentiality to produce reasonably good quantity and quality of cassia oil.

Keywords: cinnamomum cassia, microwave-assisted hydrodistillation, hydrodistillation.

INTRODUCTION

Essential oils are often defined as concentrated liquids with hydrophobic and lipophilic properties which are rich in volatile aromatic compounds and carries unique scent, flavours and essence when extracted from plant. These essential oil could be extracted from various parts of a plant such as flowers, seeds, leaves, roots and barks. In the past ages, essential oil were traditionally used in healing diseases where it was believed to have anti-bacterial, anti-fungal and anti-parasitic properties [1, 2].

However, nowadays, the demand for essential oil has increased in industries such as perfumes, cosmetics, flavouring foods, cleansing products as well as in pharmaceuticals. This was confirmed by the statistics from the United Nations comtrade in the year 2011, there was estimated 24 billion USD global market demand for flavors and fragrances from essential oils with growth of about 10% yearly [3]. Therefore, the interest in producing essential oil has been resuscitated in recent decades, due to its distinctive aromatherapy property, raising its demand especially in cosmetic industry. Also there is increasing demand for essential oils as alternative medicine due to the belief that specific aroma compounds present in essential oils has curative effects on certain diseases [4].

Essential oil could be extracted by various methods, e.g. hydrodistillation (HD), steam distillation, expression and organic solvent distillation. The most commonly used methods to extract essential oil is HD. However, monoterpenes compounds easily damage under steam distillation and conventional method HD tends to lose more volatile compounds during solvent removal [5]. Besides that, conventional methods have drawbacks of time-consuming as well as being energy intensive.

Therefore, nowadays, a lot of advanced extraction technologies are being researched by many researchers to enhance the quantity and quality of the yield of essential oil. Essential oil had been reportedly extracted from different plant materials in times past through different methods. Among these plant material, *Cinnamomum cassia* is of particular interest and several techniques are under study to extract oils from this plant for both quantitative and qualitative advantage. Notable among these is the use of microwave-assisted hydrodistillation in extraction of *Cinnamomum Cassia* oil [6, 7]. This had been perceived to be a valid alternative to the conventional method, generally because the irradiation power of microwave tend to produce more yield and shorter operating time could also be achievable [8].

Cinnamomum cassia belongs to Lauraceae family otherwise known as Chinese cinnamon, mainly distributed in Southeast Asia. [6]. The bark of *Cinnamomum cassia* is widely used as food flavouring, perfumes, and cosmetics and also acts as certain disease curative such as gastritis, dyspepsia, regulate blood circulation and inflammatory disease. Besides that, cinnamon oil rich in trans-cinnamaldehyde is believed to have antimicrobial effects against animal and plants. The present research aimed to evaluate the effect of microwave assisted hydrodistillation on operational conditions such as extraction time, water to raw material ratio and microwave power for extraction of essential oil from *Cinnamomum cassia*. Quality and quantity of extraction yield shall also be investigated by comparing the active and oxygenated compounds. In addition, the applicability of MAHD technique shall be investigated as an alternative to conventional method, HD in extraction of *Cinnamomum cassia* oil.