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THE POTENTIAL OF MICROWAVE ASSISTED HYDRODISTILLATION IN EXTRACTION OF ESSENTIAL OIL FROM CINNAMOMUM CASSIA (CINNAMON)

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ABSTRACT

In this research, Microwave Assisted Hydrodistillation (MAHD) was used to extract essential oil from Cinnamomum Cassia (cinnamon). The effect of different parameters, such as water to raw material ratio (6:1, 8:1 & 10:1), microwave power (200 W, 225 W & 250 W) and extraction time (30 min, 60 min, 90 min, 120 min & 150 min) on the extraction yield and its major constituents were investigated. The essential oil was analysed by gas chromatography/ mass spectrometric (GC-MS) to evaluate the effect of extraction method on the content of its main constituent which was trans-Cinnamaldehyde. The optimum condition was found at water to raw material ratio of 8:1, microwave power of 250 W and extraction time of 90 min and the yield obtained under this condition was about 2.55%. The result obtained from GC-MS analysis revealed that the use of microwave irradiation did not adversely influence the composition of the essential oil. The main constituents found through MAHD was more desirable in terms of quality and quantity when compared to the conventional methods. The results obtained herein suggest that MAHD method could serve as a suitable and effective method for the extraction of essential oil from Cinnamomum Cassia (cinnamon).

Keywords: MAHD, cinnamon, extraction, GC-MS, optimization.

INTRODUCTION

Cinnamomum Cassia is an evergreen tropical tree, also named as Chinnese cinnamon, which is widely distributed in Southeast Asia. Cinnamon barks and leaves are widely used as spice and flavoring agent in foodstuffs, fragrances, herbicides, insecticides and for various applications in medicines. The essential oil obtained from the bark is rich in trans-Cinnamaldehyde with antimicrobial effects against animal and plant pathogens. Cinnamomum Cassia oil may also be used as potential repellents, antifungal, antioxidant and antitumor agents (Chang, Tak, Kim, Lee, & Ahn, 2006; Giordani, Regli, Kaloustian, & Portugal, 2006; Lin, Wu, Chang, & Ng, 2003; Shin *et al.* 2006). Reports of the statistics from the United Nations comtrade showed that in 2011, there was an estimated 24 billion USD global market for fragrances and flavors from essential oils with a yearly growth rate of about 10% (Ramu Govindasamy, 2013). This increasing demand for essential oils mainly has opened up wide opportunities for its global marketing, leading to the requirement of competitive product in market. These products are often expected to come with all the advantages in term of cost, quality and its production time. Since essential oil is a volatile component, it is vital to identify the best extraction technique, so that the higher yield of essential oil with good quality can be extracted.

The main methods used to obtain essential oils or extracts from the plant materials are hydrodistillation, steam distillation, steam and water distillation, maceration, empyreumatic distillation, and expression.

Among these methods, hydrodistillation is the most common approach used for the extraction of essential oils from medicinal herbs and plants. It had been noted however that this conventional method present several drawbacks such as long extraction time, potential loss of volatile constituents, high energy use, and so on, making it unsuitable for the demands of the current market (de Rijke *et al.* 2006). Incorporation of alternative extraction techniques that is rapid, sensitive, safe, and energy-efficient is therefore highly necessary. One possible solution towards the improvement on the existing extraction processes is to implore the potential benefits of the more active and efficient enhancement which can be achieved through the use of microwave.

In an attempt to take advantage of microwave heating with the conventional hydrodistillation, MAHD was then developed and used for the extraction of essential oils or extracts from some plants. With this method, the plant material placed in a Clevenger apparatus is heated inside a microwave oven for a short period of time to extract the essential oil where heat is produced by microwave energy. The sample reaches its boiling point very rapidly, leading to a very short extraction or distillation time. Using the microwave distillation technique, it is possible to achieve distillation with the indigenous water of the fresh plant material (Kürkcüoglu & Baser, 2010). Some of the extractions to which this technique had been applied includes but not limited to extraction of essential oils from Satureja hortensis and Satureja Montana (Rezvanpanah, Rezaei, Razavi, & Moini, 2008), Mango (Mangifera indica L.) flowers (Wang, Liu, Wei, Yan, & Lu, 2010) and from Thymus vulgaris L. (Golmakani & Rezaei, 2008). Although the effect of MAHD has been conducted on a number of plant materials as mentioned above, its effect on Cinnamomum Cassia has not yet been explored which makes it a good area for research.