The Extraction Of Rosemary Essential Oil By Microwave Assisted Distillation

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Abstract

Rosemary (Rosmarinus officinalis L.) has been a significant herb with recognized antiseptic, astringent, antifungal, antibacterial, and antioxidant properties. This study aimed to optimize the microwave-assisted distillation process for extracting rosemary essential oil by investigating the effects of feed-solvent ratio, distillation power, feed leaf size, and distillation time on the yield.

Optimal extraction conditions were determined as a feed-solvent ratio of 1:1, distillation power of 380W, distillation time of 25 minutes, and feed leaf size of 0.8-1 cm, resulting in a maximum yield of 2.7%. The study provided a comparative analysis of essential oil quality and quantity and proposed a mechanism for microwave-assisted extraction of rosemary essential oils.

Introduction

Rosemary (Rosmarinus officinalis L.) is a member of the Lamiaceae family, which encompasses approximately 200 genera and 3,500 species. Notably, rosemary is the sole member of its genus that thrives naturally in the Mediterranean region. The primary constituents identified in rosemary essential oil include α-Pinene, camphor, 1,8-cineole, camphene, borneol, and verbenol. These compounds exhibit antifungal, antibacterial, and antioxidant properties.

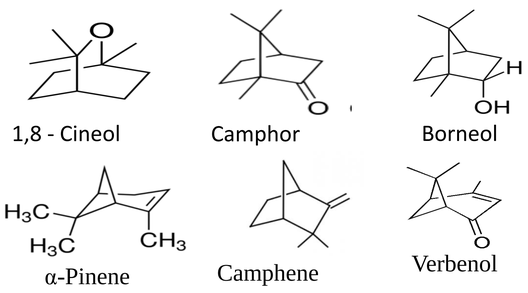


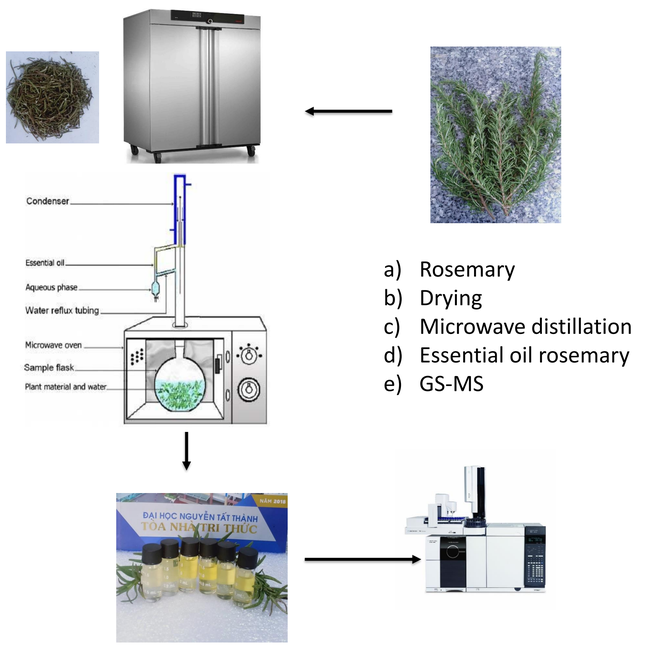
Figure 1. Structure of active substances

Methods and Materials

Fresh rosemary leaves were collected in 8/2019 from the Seed Garden , Lam Ha, Lam Dong and dried at a temperature of 50C until the humidity reaches 8-10% .

Table 1. Effective factors in black pepper essential oil distillation

DESCRIPTION	CONDITION
Feed ratio	1:0.5, 1:1, 1:2, 1:3, 1:4
Power (W)	100, 230, 380, 520, 700
Material size (cm)	1.5, 0.3, 0.1, powder
Distillation time (minute)	5, 10, 15, 20, 25, 30, 35, 40, 45, 50.



a) Rosemary
b) Drying
c) Microwave distillation
d) Essential oil rosemary
e) GS-MS

Figure 1. Expenrimental process

Results

Optimal parameters for microwave-assisted distillation of rosemary essential oil were determined as follows: a material-to-solvent ratio of 1:1, a power of 380W, a material size of 0.1 (units needed), and a distillation time of 25 minutes. Under these conditions, the maximum yield obtained was 2.7%.

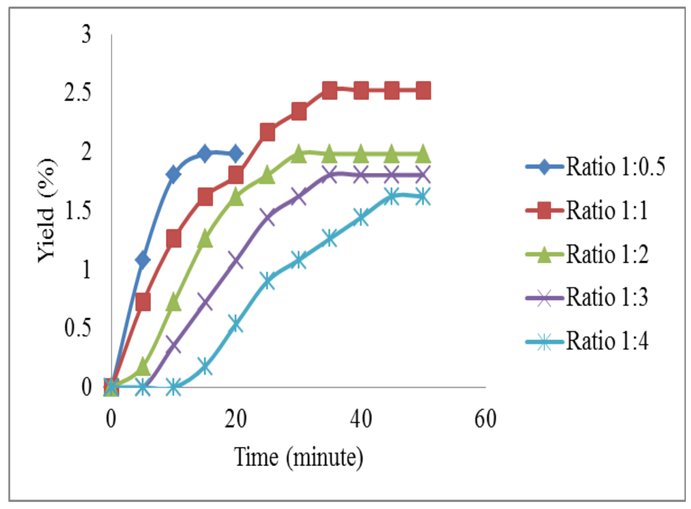


Chart 1. The effect of raw material ratio on process efficiency

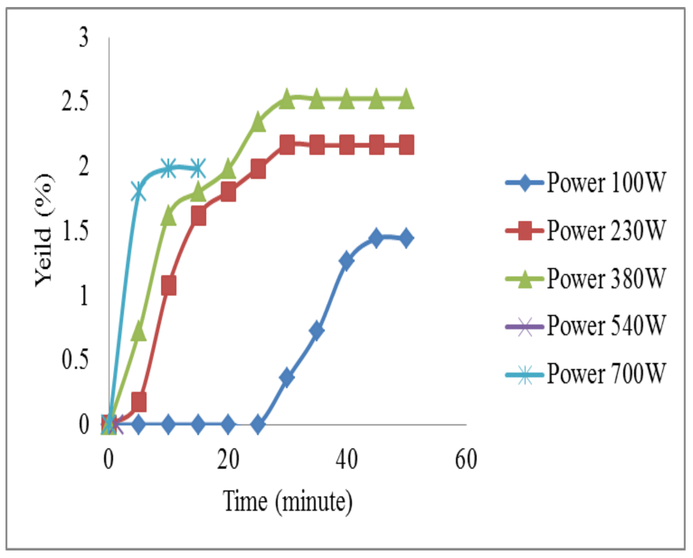


Chart 2. The effect of power on process efficiency

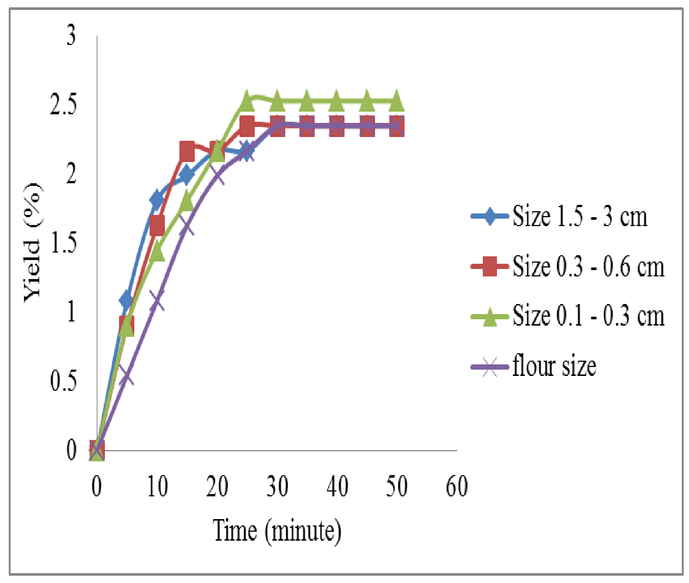


Chart 3. The effect of material size on process efficiency.

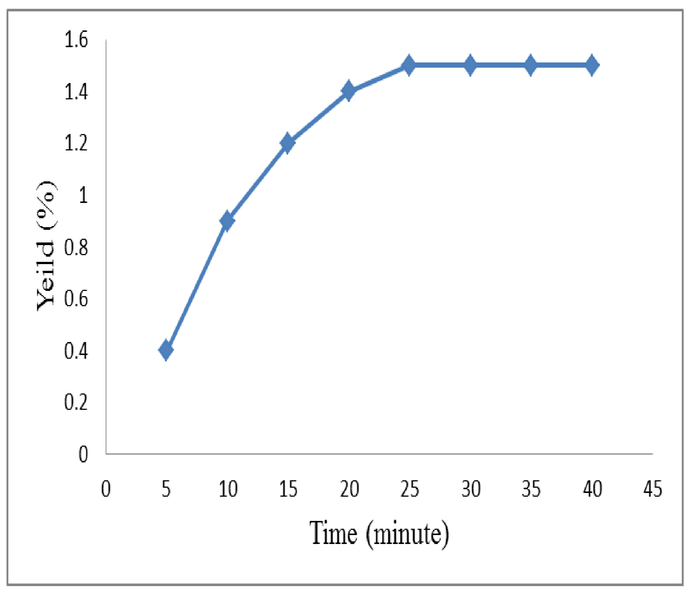


Chart 4. The effect of distillation time on process efficiency

Figure 2. Profucts from Rosemary essential oil

Conclusions

The yield of rosemary oil (RO) extraction using microwave-assisted distillation was 2.7% higher compared to the traditional method. In terms of distillation time, the microwave-assisted method achieved a significantly faster extraction rate, with essential oil production completed within 20-25 minutes compared to the classical hydrodistillation process. Due to limitations in time and available equipment, a comparative analysis with other methods could not be performed.

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