

SHORT COMMUNICATION

Microwave Assisted Extraction of Lemongrass Oil

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Key words

Lemongrass, Essential oil, Microwave-assisted, Hydrodistillation

Abstract

Lemongrass is an important member of the grass family grown mostly as a source of citral in its essential oil, which is widely for the production of artificial vitamin A. In this study, essential oil of lemongrass was extracted by microwave-assisted hydrodistillation (MAHD) and the individual effects of process parameters; microwave power and irradiation time. Results showed that oil yield increases with increasing microwave power and irradiation time. The maximum oil yield in MAHD was 1.72% for 90 minutes. Longer irradiation time resulted in inferior quality of essential oil. Microwave assisted extraction can significantly reduce the extraction time, resulting in better extraction efficiency as compared with conventional extraction methods.

INTRODUCTION

The use of herbs and spices by mankind for different purposes is very old all over the world. These plants have been invaluable resources as food additives, flavors, fragrances, pharmaceuticals, colors or medicine useful in daily life. Essential oils are complex volatile compounds produced in different plants parts, which are known to have various functions in plant including conferring pest and disease resistance.¹ They are complex mixtures of volatile compounds such as terpenes (mostly monoterpenes and sesquiterpenes), phenolics and alcohols.² Various different methods can be used for extraction of essential oils from plant materials, e.g. hydro-distillation (HD), steam distillation, Soxhlet extraction, and simultaneous distillation–extraction. However these molecules are thermally sensitive and vulnerable to chemical changes.³ A new “green” techniques in essential oil extraction have been developed by researchers. These techniques typically use less solvent and energy, such as supercritical fluids, ultrasound and microwave.⁴ This work deals with the extraction of lemongrass (*Cymbopogon flexuosus*) essential oil by the above mentioned MAHD method.

Cymbopogon flexuosus (Nees), Stapf. (Gramineae), commonly known as Lemongrass, is widely used as an essential ingredient in Asian cuisines due to its sharp lemon flavor. In India, a tea prepared from lemongrass is used as a sedative for the central nervous system.⁵ Lemongrass is a plant from the grass family and may have 1–2% essential oil in a dry basis. The essential oil is characterized by a high content of citral (constituted by the isomers neral and geranial), which is used as a raw material for the production of ionone, vitamin A and beta-carotene.⁶

METHODOLOGY

Materials

Lemongrass herb was obtained from Chandra Shekhar Azad Agricultural Farm, Kanpur (India).

Microwave Assisted Hydrodistillation

Microwave-assisted hydro-distillation (MAHD) was performed at atmospheric pressure with a microwave frequency of 2450 MHz using a household microwave oven which was modified to facilitate the hydro distillation.

The lemongrass plant were properly cleaned and grated in to 3 cm. long pieces. Before extraction of essential oil plant was stored in shade with limited air circulation and three different drying durations. The moisture lost during 24 h was 9-10%. A 100 g of sample was placed in reactor with 5:1 (w/w) of water to plant ratio. The runs were taken at three different levels of time and microwave power. Light yellow colored oil, with a lemon like odor, was obtained which was separated and dried over the minimum amount of anhydrous sodium sulfate to remove traces of moisture.

RESULTS AND DISCUSSIONS

Effect of Microwave Power on Oil Yield

Fresh samples of same weight, 100 g. each were extracted with three microwave power levels ML and MH for maximum of 120 min. From the results that extraction at 288 watt of power oil yield was very low and oil yield increases and reached to a maximum at 640 watt of microwave power level. It took only 90 minutes for complete recovery of oil at both the power levels; ML and MH.

Effect of Extraction Time on Oil Yield

Experimental results showed that the extraction yield increased with time. Total yield of extraction was 1.72% (w/w). This is in agreement with the previous findings of Lucchesi et al. and Chemat et al. that MAE of essential oils from cumin, star anise and lavender needed shorter times than did HD.⁷⁻⁸

CONCLUSION

Extraction of essential oils of lemongrass is studied using MAHD. It was observed that the MAHD required more time heating to boiling point and therefore higher energy. MAHD resulted in higher oil. The sudden warming of water in plant cells causes rupture of cell walls and release of volatile oil; components are contained in the mass of water vapor released from the plant. Thus it was possible to

obtain a very fast and efficient process of releasing plant volatile components. Warming up should still be moderate; the use of high microwave power may degrade valuable components. For these reasons, MAHD is a promising tool for the extraction of essential oils from medicinal plants and aromatic herbs and also very interesting for food industry and aromatherapy.

DECLARATION OF INTEREST

It is hereby declared that this paper does not have any conflict of interest.

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