

MICROWAVE EXTRACTION OF ESSENTIAL OILS FROM SPICES

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Abstract

Essential oils (EOs) are one of the most valuable products obtained from spices, with a well-established importance in the flavour, fragrance & pharmaceutical industries, as well as in traditional medicine. Their role as active agents in controlling plants bacterial diseases has also been increasingly studied.

Extraction of cumin EO from *Cuminum cyminum* L seeds was chosen as a benchmark for the proposed methodologies due to the high extraction yields and its commercial value. Cumin is the second most popular spice in the world, having well established use in traditional medicine due to their diuretic, carminative, spasmodic and emmenagogic effects. In MAE (Microwave-Assisted Extraction), microwave irradiation promotes extraction process through the principle of dipole rotation and ion conduction, it makes MAE to be one of the promising methods. The information presented here is a review of previous researches¹

Discussion

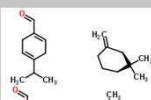
Microwave technology has been regarded as an efficient method, which dramatically reduces extraction duration, increases yield and improves extract quality. Microwave steam distillation (MSD) and Microwave hydro distillation (MHD) works on the same principle and the only difference is that steam is directly brought instead of heating water to produce steam.

Advantages: MAE has overcome the defect of traditional techniques such as energy consumption, more duration and heavy labour intensity. This takes less time, energy and also consumes less solvent.

Disadvantages: high capital cost, efficiency of MAE is less when solvent is non polar or volatile

Conclusion

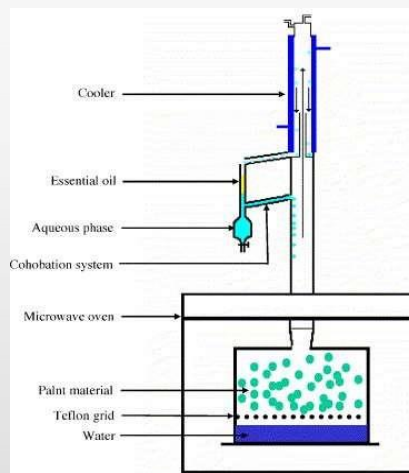
Process of the extraction of essential oil MSD is an original combination of microwave heating and steam distillation. The efficiency of new technique MSD is highly considerable than other method of extraction of essential oil from certain spices. MSD highly accelerated the isolation process, without causing changes in the volatile composition. This method could be appreciate for the routine quality control analysis of essential oils from spices and aromatic herbs.



Cumin Oil Structure

Introduction

Extraction is the method of removing active constituents from a solid or liquid by means of a liquid solvent. Microwave assisted extraction (MAE) is a process of using microwave energy to heat solvents in contact with a sample in order to partition analytes from the sample matrix into the solvent. The microwaves when passed through solvent medium with plant materials, will rupture the cell walls and release the bioactive compounds to the solvent. Microwave irradiation (MW)-ranges from 300 MHz to 300 GHz. The spice oils and oleoresins are extracted due to their functional properties and are the desired compounds in spices. Quality and composition can be maintained irrespective of any other variations in the raw material. Cumin (*Cuminum cyminum* L.) is a small annual herbaceous plant belonging to the Apiaceae family, cultivated in the Middle East, India and China. It is generally used as a food additive and flavoring agent. According to the relevant reports, cumin showed commercial value and beneficial pharmacological properties like antibacterial, antioxidant, anticancer and hypoglycemic actions, which are mostly attributed to its essential oil and polyphenolic compounds



Microwave Accelerated Steam Distillation

Result

According to the study conducted by Karla Hernandez, Universidad de Guanajuato: CEO Contains β -pinene (23.5%), terpinene (22.82%), cuminol (22.73%), m-Cymene (18.61%), 2-Caren-10-ol (3.41%), 1R- α -Pinene (1.77%),

While cuminol (65%), m-cymene (6.8%) and β -pinene (3.8%) were predominant in CEO obtained by SD¹. So it is evident that MAE is a good method to obtain cumin essential oil with relatively high yield in shorter time, than other conventional methods.

Materials and methods

From the literature review¹, it is found that cumin seeds are taken and the dry samples pulverised into powder, filtered through a 60-mesh sieve before using for experiments.

Microwave steam distillation (MSD)

- The plant material should be packed above the water separated by a Teflon grid inside the microwave cavity. At the bottom, steam will be produced by heating water directly with microwave irradiation.
- Process flow; steam produced in the lower part of the apparatus passes through the vegetal matrix, evaporating and carrying the essential oil towards the cooler on the top of the microwave oven. An electrical steam generator and a cooler placed outside the microwave oven should be connected to a cartridge containing the plant material inside the microwave oven. The plant material will be subjected to a microwave heating as soon as the vapour starts to cross it. The steam flows through the sample, evaporating and carrying the essential oil.
- Temperature of the solvent from 60-120 degree Celsius and the extraction time will be around 1.5 hours. Efficiency increases with the increase in temperature until an optimal temperature is reached and then decreasing with the further increase in temperature.



Microwave Steam Distillation



Cumin Seed Oil

References

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