

Kinetics of mace (*Myristicae arillus*) essential oil extraction using microwave assisted hydrodistillation: Effect of microwave power

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ABSTRACT

Mace essential oil extractions were carried out using hydrodistillation (HD) and microwave assisted hydrodistillation (MAHD). The powers used were varied from 300, 600, and 800 W. The amounts of oil from dew resulted from condensation were measured every 1 min. The condensation was done using 12 °C cold water. From the experimental results, MAHD is seen to be superior to HD. The extraction using MAHD at 800 W stopped after 20 min (8.63% yield), while the one using HD stopped after 73 min (7.03% yield). The power used affected the yields of essential oils obtained. From the various powers used, in 10 min, the yields obtained were 2.68, 4.56, 5.41%, in 15 min 4.12, 6.20, 6.83%, and in 20 min 5.13, 7.39, 6.83% at 300, 600, and 800 W, respectively. It can also be seen that time has a significant effect on the essential oil yields obtained. The main components of the essential oil obtained from HD and MAHD were beta pinene, alpha pinene, myristicin, 4-terpineol, and gamma terpinene. The mechanism of mace essential oil mass transfer using HD and MAHD methods was controlled by intra-particle diffusion following the Fick's law. The diffusion coefficient (De) of HD was 4.98×10^{-14} m²/s and the diffusion coefficients of MAHD were 9.17×10^{-14} , 1.39×10^{-13} , and 1.65×10^{-13} m²/s at 300, 600, and 800 W, respectively. The empirical correlation of diffusion coefficient and MAHD power can be approximated by $De = 3.02 \times 10^{-15} \times P^{0.5985}$.

KEYWORDS:

Diffusion; Essential oil; Extraction; Hydrodistillation; Mace; Microwave assisted hydrodistillation