Study of ultrasound-assisted emulsions on microencapsulation of ginger essential oil by spray drying

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Highlights
- The use of ultrasonication was efficient in the emulsion formation.
- The emulsions obtained by using ultrasound presented smaller droplets.
- The mixture containing maltodextrin proved to be an effective matrix.
- Inulin and maltodextrin improved the physical properties of the particles.

Abstract
This study aimed to evaluate the influence of the encapsulating matrix on producing spray-dried ginger essential oil powders using blends of gum Arabic (GA), maltodextrin (MD) and inulin (IN) as wall materials. The effects of emulsification process assisted by ultrasonication on kinetic stabilization of emulsions used as the feeding liquid in the spray drying were evaluated. The emulsions obtained by using ultrasound were more stable and presented smaller droplets ($\leq 2.03 \pm 0.01 \mu m$). The use of MD and IN together with GA improved the wettability of the powders ($245 \pm 21$ s). GA:MD powders adsorbed less water vapour than other treatments under the same storage conditions. The partial replacement of GA by MD affected...
considerably the encapsulation efficiency showing the higher value for this parameter (93.0 ± 0.8%). Larger microparticles were observed in the powders prepared with GA (15.44 ± 0.13 μm) or a mixture of GA and MD (15.83 ± 0.14 μm). The physical and chemical properties of the microparticles were substantially modified by using IN or MD together with GA. Based on the studied properties, the microparticles produced with GA and MD were considered to present the better characteristics for wettability, encapsulation efficiency and higroscopicity.

Keywords

Zingiber officinale; Spray drying; Biopolymers; Ultrasonic technology; Encapsulation efficiency; Adsorption isotherms

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