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Microencapsulation of Peppermint Oil by the Complex Coacervation Method

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Editorial

Peppermint oil is one of the most often used food ingredients also, highly volatile and unstable in processed food [1]. The component found in high concentrations in peppermint oil is L-Menthol. L-Menthol is a cyclic terpene alcohol and the cause of peppermint oil`s good scent that widely used in pharmaceutical, cosmetic and food uses. The main form of menthol occurring in nature is (−)-menthol, which is assigned the (*1R,2S,5R*) configuration (Figure 1). However, L-Menthol is very volatile that limit its application in processed food. To restrict loss of L-Menthol during process or storage, it is useful to encapsulate it. Nowadays, microencapsulation is widely applied in protection of volatile materials and its controllable release [2,3]. On the other hand, controlled release of food ingredients at the right place and the right time is a key functionality that can be provided by microencapsulation [4].

Microencapsulation is a process in which tiny particles or droplets are surrounded by a coating to give small capsules of many useful properties. The reasons for microencapsulation are countless. In some cases, the core must be isolated from its surroundings, as in isolating vitamins from the deteriorating effects of oxygen, retarding evaporation of a volatile core, improving the handling properties of a sticky material, or isolating a reactive core from chemical attack [5]. In other cases, controlled release of food ingredients at right place and right time is a key functionality that can be provided by microencapsulation [4]. Microcapsules are prepared by different methods such as simple or complex coacervation, extrusion, co-crystallization, fluidized bed and spry drying [2,6].

Microencapsulation by coacervation is the phase separation of one or many hydrocolloids from the initial solution then agglomeration into separate, liquid phase called coacervate [4,7]. Coacervation can be simple types (with a polymer) or complex type (combining two or more polymer). When two polymers are used, the two polymers in a specific pH with opposite charges are intertwined and form a coacervate [8,9]. Microcapsules prepared by complex coacervation are insoluble in water and heat resistant and offer controlled release properties [1].

Complex coacervation by gelatin-arabic gum system is the most successfully studied due to their abundance, biocompatibility, biodegradability and safe [10,11]. These two biopolymers undergo associative electrostatic interactions followed by phase separation to create the layer of complex coacervates surrounding active-containing oil-in-water emulsion droplets. The liquid coacervate layer can be transformed to a rigid membrane by gelatin cross-linking. Formaldehyde or glutaraldehyde, which can form Schiff's base with the free amino groups of gelatin, is commonly used as cross-linking agents [12]. However, such aldehyde agents are considered to be toxic to human body, which is one of the major limitations of using the complex coacervation to produce microspheres in food and pharmaceutical industries [8,13]. Tannins, plant polyphenols, could be used as a safe alternative cross-linker by ability to link with proteins such as gelatin, through hydrogen bonding and hydrophobic interactions [12].

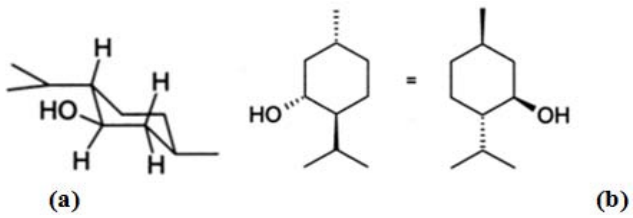

Figure 1: (a): (-)-Menthol, (b): chair form of (-)-Menthol [1].

The main of this review was to prepare L-menthol microspheres by complex conservation using gelatin-arabic gum system and tannic acid, a natural polyphenols, as cross linker instead of aldehyde compounds: the first arabic gum and gelatin solution were prepared with known concentrations. To prepare gelatin solution, 50°C water bath was used to facilitate dissolution of the gelatin. After that menthol, which was melted at 50°C, was added to gelatin solution. Then gum arabic and Tween 80 solution, with a 1:1 mass ratio of gelatin to gum arabic was added to mixture. Then, in a 40°C water bath, the pH of mixture was adjusted to 4 by adding acetic acid 10%. After the mixture was putted in ice bath until the temperature reached 4°C. Tannic acid was added to the mixture and put on stirrer to reach ambient temperature. Coacervate liquid deposited at the bottom of the container was washed with distilled water and dried using a freeze dryer. At the end, spherical microspheres with smooth surface were formed. The results showed that, increasing concentration of core and wall materials, increases efficiency. Evaluation of microcapsules release in the SGF and SIF indicated that large amount of menthol is released in the SGF environment that is not suitable solution for medicinal cases [14].

References

1. Dong Z, Ma Y, Hayat K, Jia C, Xia S, Zhang X. "Morphology and release profile of microcapsules encapsulating peppermint oil by complex coacervation". Journal of Food Engineering. 2011; 104: 455-460.

2. Soottitantawat A, Takayama K, Okamura K, Muranaka D, Yoshii H, Furuta T, et al. "Microencapsulation of l-menthol by spray drying and its release

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characteristics". Innovative Food Science & Emerging Technologies. 2005; 6: 163-170.

3. Mortenson MA, Reineccius GA. "Encapsulation and release of menthol. Part 1: The influence of OSAn modification of carriers on the encapsulation of l-menthol by spray drying". Flavour and Fragrance Journal. 2008; 23: 392-397.

4. Gouin, Sébastien. "Microencapsulation: industrial appraisal of existing technologies and trends". Trends in Food Science &Technology. 2004; 15: 330-347.

5. Madene A, Jacquot M, Scher J, Desobry S. "Flavour encapsulation and controlled release–a review". International Journal of Food Science & Technology. 2006; 41: 1-21.

6. Sarkar S, Gupta S, Variyar PS, Sharma A, Singhal RS. "Irradiation depolymerised guar gum as partial replacement of gum arabic for microencapsulation of mint oil". Carbohydrate Polymers. 2012.

7. Korus J. "Microencapsulation of flavours in starch matrix by coacervation method". Polish Journal of Food an d Nutrition Sciences. 2001; 10: 17-23.

8. Dong Z, Toure A, Jia C, Zhang X, Xu S. "Effect of processing parameters on the formation of spherical multinuclear microcapsules encapsulating peppermint oil by coacervation". Journal of Microencapsulation. 2007; 24: 634-646.

9. De Kruif CG, Weinbreck F, De Vriez R. "Complex coacervation of proteins and anionic polysaccharides", Current Opinion in Colloid & Interface Science. 2004; 9: 340-349.

10. Mayya KS, Bhattacharyya A, Argillier JF. "Micro-encapsulation by complex coacervation: influence of surfactant", Polymer International. 2004; 52: 644-647.

11. Najafi A, Vahabzadeh F. "Microencapsulation of orange oil by complex coacervation and its release behavior". International Journal of Engineering. 2004; 17: 333-342.

12. Xing F, Cheng G, Yang B, Ma L. "Microencapsulation of capsaicin by the complex coacervation of gelatin, acacia and tannins". Journal of Applied Polymer Science. 2004; 91: 2669-2675.

13. Zhang ZQ, Pan CH, Chung D. "Tannic acid cross linked gelatin–gum arabic coacervate microspheres for sustained release of allyl isothiocyanate: Characterization and *in vitro* release study". Food Research International. 2011; 44: 1000-1007.

14. Pakzad H, Alemzade I, Kazemi A. "Encapsulation of peppermint oil with Arabic Gum - Gelatin by complex coacervation method". IJE. 2013; 26: 807-814.

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