Received: 21 March 2017 | Revised: 20 June 2017 | Accepted: 9 July 2017
DOI: 10.1111/jfpp.13446

ORIGINAL ARTICLE
WILEY Journal of Food Processing and Preservation
Institute of Food Science + Technology ifst

Formulation of stable microcapsules suspensions content *Salvia officinalis* extract for its antioxidant activity preservation

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Abstract

The stabilization of microparticles suspensions is always assured by macromolecules that allow the increasing of dispersing phase viscosity and maintaining the microparticles dispersibility. In this work, the effect of xanthan gum, tragacanth, and sodium alginate on the stability of gelatin–pectin microcapsules suspensions containing sage polyphenols as an active substance was investigated. After polyphenols extraction from *Salvia officinalis*, their characterization by HPLC-UV/DAD and their microencapsulation by complex coacervation technique using gelatin and pectin. Three different suspensions of microcapsules were prepared using different polymeric dispersant agents. The suspensions were characterized by laser for particle size, zetametry, viscosimetry, and evaluation of their antioxidant activities was carried out by the DPPH scavenging radical method. Stability study of prepared suspensions was undertaken during 90 days, the results obtained showed that sodium alginate and tragacanth had a better stabilizing effect compared with xanthan gum. After formulation of sage extract, its antioxidant activity increases and its half-life time increases from 12.75 ± 1.95 days ($R^2 = .93$) to 258.64 ± 21.99 days ($R^2 = 0.98$).

Practical applications

Microencapsulation yield of sage extract in gelatin–pectin is 73.54 ± 2.04%. About 0.5% of sodium alginate permits the stabilization of microcapsules suspension. Sodium alginate and tragacanth had a better stabilizing effect compared with xanthan. After formulation, antioxidant activity of sage extract increases. After formulation, half-life time of sage extract increases from 12.75 ± 1.95 to 258.64 ± 21.99 days.

1 | INTRODUCTION

The stabilization of suspensions containing microparticles is a purpose that different industries look to achieve. Effectively, several active ingredients used in different industries are insoluble in aqueous solutions and present a very low physicochemical stability in these environments, as some drugs (Blessy, Patel, Prajapati, & Agrawal, 2014), preservatives (De Vos, Faas, Spasojevic, & Sikkema, 2010), antioxidants (Hernández-Jaimes, Fouconnier, Pérez-Alonso, Munguía-Guillén, & Vernon-Carter, 2013), pesticides (Szente, 1998), bacteria (Muhammad, Ramzan, Huo, Tian, & Bian, 2017), and chemical catalysts (Scott, Datye, & Crooks, 2003), used by pharmaceutical, food, cosmetics, phytosanitary, and chemical industries, respectively.

Physical instability of these suspensions is described by a rapid separation of the dispersed phase and a very difficult redispersibility of this phase in continuous phase (Vincent, 1974). On the other hand, the chemical instability is mainly due to the effect of water composing the dispersing phase on different dispersed ingredients (Di Mattia, Sacchetti, Mastrocola, & Pittia, 2009).

Xanthan gum is a natural polysaccharide of microbial origin that presents high viscosifying effect (Garcıa-Ochoa, Santos, Casas, & Gomez, 2000). Tragacanth is a natural gum composed of two different types of polysaccharides, tragacanthine (30–40%) which is a water-soluble hydrocolloid and bassorin (60–70%) which is insoluble in water and swells for forming a hydrogel (Azarikia & Abbasi, 2010). Alginates are natural polysaccharides extracted from marine algae having a high negative charge (George & Abraham, 2006). The common point of these three different polymers previously described (xanthan gum, tragacanth, and sodium alginate) is their ability to increase the viscosity of an aqueous solutions (Azarikia & Abbasi,

