Microencapsulated oregano essential oil in grated Parmesan cheese conservation

1Fernandes, R.V.B., 2Botrel, D.A., 2Monteiro, P.S., 1Borges, S.V., 1Souza, A.U. and 2Mendes, L.E.S.

1Food Science Department, Federal University of Lavras, 37200-000, Lavras, MG, Brazil
2Institute of Agricultural Sciences, Campus de Rio Paranaíba, Federal University of Viçosa, 38810-000, Rio Paranaíba, MG, Brazil

Abstract

The objective of this study was to produce particles containing oregano essential oil by spray drying applying whey protein isolate as wall material, and to evaluate its antimicrobial effect on inhibiting growth of fungi in grated Parmesan cheese. The microcapsules contained 18% (w/w) of oregano essential oil and a 90% microencapsulation efficiency was found. Carvacrol, cymene, γ-terpinene, thymol and β-caryophyllene were the main components identified in free oregano essential oil and in the oil extracted from the microcapsules. Application of microencapsulated oregano oil was effective inhibiting the growth of fungi and yeast during 45 days of grated cheese storage. Only the treatment containing 0.5% of microencapsulated oil still remained with undetectable counting, being considered the most effective treatment in the control of filamentous fungi and yeast growth in grated parmesan cheese. The study confirms the antimicrobial effect of oregano oil and the maintenance of the microcapsules antimicrobial activity over the storage time.

Introduction

Cheese is a dairy product known for its many varieties, range of textures and flavours, nutritional value and its diversity as an ingredient (Callaghan and Kerry, 2014). The Parmesan cheese, also known as Grana, Parmigiano Reggiano or Grana Padano, is originated from the river Pó valley, one of the most traditional places in cheese production in Italy and typically is subjected to the ripening process during one to three years for obtaining a soft and crispy texture (Sora et al., 2013). The Grana Padano and Parmigiano Reggiano cheeses are made by hand in specific North areas of this country and use raw and reduced-fat bovine milk without heat treatment (Langford et al., 2012). In Brazil, this type of cheese is subjected to ripening for at least six months, although the current Grana cheese type is industrialized within a 12 months ripening period (Sora et al., 2013). The grated Parmesan cheese is a product ready for consumption drawn from the crumbling or grating of the mass of one or up to four varieties of low moisture cheeses apt to human consumption and may be partially dehydrated or not (Brazil, 1997; Pimentel et al., 2002), and typically consumed with sauces and pasta (Trombete et al., 2014).

The lack of control and/or poor hygiene conditions during the production of cheese can contribute to the occurrence of microbial contamination. The cheese pH (5.0-6.5), salt concentration, water activity, time of ripening, storage temperature and the presence of co-factors allow a favorable environment for microbial growth (Custódio et al., 2007). The food deterioration due to the presence of bacterial and fungal contamination has been one of the major concern, besides causing considerable loss of food worldwide (Wang et al., 2009). Moreover, the conditions of production, distribution and marketing can make cheese improper for consumption because of contamination with deteriorative and pathogenic microorganisms as well as compromising the sensory characteristics of the cheese (Wolupcek et al., 2012).

The additives used in foods have antimicrobial and antioxidant properties and buffering capacity and are used as preservatives in different types of products to prevent their deterioration. The antimicrobial properties of the potassium sorbate are well known, being a frequently used additive conservation of a wide variety of foods (Knicky and Spörndly, 2011). The potassium sorbate is widely used to preserve processed foods such as soft drinks and fruit juice by inhibiting the growth of fungi and preventing deterioration (Gören et al., 2015). Furthermore, it is a preservative commonly used by Brazilian dairy