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Bridging Traditional and Novel Foods: Composition, Structure and Functionality

Abstracts

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In-vitro release profile of microencapsulated α-tocopherol under simulated gastrointestinal conditions

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Alpha-tocopherol, the most common form of Vitamin E in nature, is a well-known antioxidant compound for its effective inhibition of lipid oxidation both in food and biological systems. Additionally, due to its preventive action against reactive oxygen species (ROS), α-tocopherol has been associated with risk decreasing of diseases associated with oxidative stress, such as cardiovascular disease and cancer [1]. The recommended ingestion of Vitamin E varies among the countries and according to criteria such as sex and age. In the USA, the recommended daily allowance (RDA) for an adult is 15 mg/day, whereas in Europe it is 4-15 and 3-12 mg α-tocopherol/day for man and women, respectively. Although α-tocopherol is naturally present in several foods, such as vegetable oils and tree nuts, owing to its antioxidant capacity it is frequently included in food supplements and used in the food industry to extend the shelf-life of several products. Nevertheless, due to α-tocopherol instability and sensitivity towards oxygen and light and its poor aqueous solubility, it is generally administered in the acetate or succinate form. However, these forms are considered to have a lower intestinal absorption compared to α-tocopherol [2]. To overcome these problems, the encapsulation of α-tocopherol in protective matrixes to avoid its oxidation and increase shelf life has been suggested. In fact, during the last years, encapsulation technology has been increasingly important in the food industry as it permits the formation of a physical barrier between the external medium and sensitive core materials, being also used for controlled release of active molecules, formulation stability enhancement, and flavor and taste masking. In this context, it is important to assess α-tocopherol release pattern from microparticles as it can restrain its different applicability.

In this work, α-tocopherol microspheres were produced using alginate as a polymeric matrix. This polymer, a linear polysaccharide obtained from brown algae consisting of β-mannuronic acid and α-guluronic acid units, was chosen due to its biocompatibility, biodegradability and non-toxicity. Moreover, it presents a high stability at acidic pH, being easily swollen under mild alkali conditions. Alginate microspheres (ME) loaded with α-tocopherol were produced using a NISCO Var J30 atomization unit, following a previously optimized methodology. The produced microspheres were evaluated for encapsulation efficiency and α-tocopherol release profile by measuring the absorbance at 297 nm using a spectrophotometer. The encapsulation efficiency was calculated both by directly measuring the maximum content released after ME disruption and by quantifying the nonencapsulated α-tocopherol present in the $CaCl_2$ coagulation solution and in the wash solution. α-Tocopherol in-vitro release profiles were determined under simulated gastric (pH 1.2) and intestinal (pH 7.4) media during a period of 24 hours. Additionally, a sample of ME were mixed in gastric media during 1h and then transferred to intestinal media until a total of 24h to simulate gastrointestinal conditions. During the testing period samples of the supernatant were periodically taken to determine the amount of released α-tocopherol. Results evidence a very low % of α-tocopherol release under acidic conditions while an almost complete release is achieved when ME were submitted to simulated intestinal conditions suggesting that the proposed approach can constitute an interesting solution to protect α-tocopherol, allowing for its release in the intestine after ingestion. The next steps in this work in progress will include the evaluation of release profiles of ME added to different food matrices.

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