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v/v) and additional 20 mL of the alginate solution. The prepared mixture was homogenized at 11400 rpm during 15 min using a CAT Unidrive ultraturrax resulting in a fine divided emulsion which was then atomized using a NISCO Var J30 unit operating at a pressure of 0.1 bar and a flow rate of 0.3 mL/min. The obtained ME were consolidated upon contact with 250 mL of a CaCl<sub>2</sub> (4%, w/v) coagulation solution during 20h. After consolidation, ME were recovered by filtration, washed with deionised water and observed by optical microscopy (OM).

#### Encapsulation Efficiency

The encapsulation efficiency (E.E.) was determined by the indirect method, based on the quantification of the nonencapsulated  $\alpha$ -tocopherol present in the coagulation solution and in the wash solution.  $\alpha$ -Tocopherol was quantified by spectrophotometry by measuring the absorbance at 297 nm. The amount of encapsulated  $\alpha$ -tocopherol was calculated by difference, considering the maximum theoretical amount of  $\alpha$ -tocopherol in the atomized emulsion volume.

#### Release profiles of $\alpha$ -tocopherol

$\alpha$ -Tocopherol release into simulated gastric (pH 1.2) and intestinal (pH 7.4) media [5,6] was determined by mixing 1 g of ME into 50 mL release media. The suspension was stirred at 100 rpm to ensure good contact between microspheres and media, and samples were periodically collected during a total of 24h. Each sample (5 mL) was centrifuged at 2000 rpm for 1 min and the amount of  $\alpha$ -tocopherol in the supernatant was determined by spectrophotometry. After reading the absorbance, the sample was gently homogenized and reintroduced in the flask containing the ME suspension.

#### Results and Discussion

The produced ME were individualized and had a spherical shape when visualized by MO (data not shown). Table 1 presents the encapsulation efficiency results obtained for different assays.

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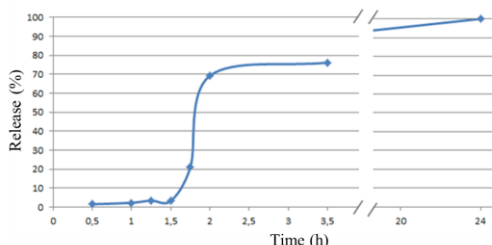
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**Table 1.** Encapsulation efficiency (E.E.) of alginate microspheres (ME).

Assay	Atomized Emulsion (mL)	ME (g)	Non-encapsulated Tocopherol (mg)	E.E. (%)
I	26	6.44	0,42	99.79
II	25	7.67	0,20	99.90
III	18	5.39	0,24	99.88

The results showed that a very high E.E. was attained, probably due to the high hydrophobicity of the encapsulated substance. Release profiles of  $\alpha$ -tocopherol, showed that within 24h a maximum of 2% was released (data not shown) while under intestinal simulated conditions a complete release (100%) was attained. As can be observed in Fig.1 after two hours, approximately 70% of the active substance was released.



**Figure 1.** Release profile under simulated intestinal conditions (pH = 7.4)

#### Conclusion

The proposed ME process allowed achieving a very high encapsulation yield of  $\alpha$ -tocopherol. As expected, the release of the active substance from the ME was very low at acidic pH and much higher at pH 7.4, attaining almost a complete release under simulated intestinal conditions. Thus, the proposed microencapsulation process can constitute an interesting solution to protect  $\alpha$ -tocopherol, allowing its release under gastrointestinal conditions.