ENCAPSULATION OF VANILLIN IN ALGINATE/CHITOSAN HYDROGEL BEADS

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INTRODUCTION

Vanillin is a natural product occurring in tropical specie *Vanilla planifolia*. It is used as a flavor enhancer in the food industry, perfumery and pharmaceuticals. It has been previously reported that vanillin is more than a flavoring agent and could serve as a potential antioxidant. Considering the importance of vanillin application in the food area, we applied the encapsulation technique using vibration technology (Encapsulator B-390) to produce alginate and alginate/chitosan hydrogel beads containing vanillin as core material.

METHODS

EXPERIMENTAL CONDITIONS

Encapsulation mixture:
3.75% alginate, 1% vanillin
Cross-linking solution:
- 5% $CaCl_2$
- 0.5% chitosan and 1% citric acid
- 1% chitosan and 2% citric acid
- 1.5% chitosan and 3% citric acid
- 2% chitosan and 4% citric acid

Encapsulator:
1000 µm nozzle, 100 Hz, 1000 V, 130 mbar

RESULTS

Table 1 Antioxidant activity (DPPH, ABTS, FRAP, CUPRAC assays), total polyphenols and HPLC analysis of hydrogel beads

Sample	DPPH (µmol/kg)	ABTS (µmol/kg)	FRAP (µmol/kg)	CUPRAC (µmol/kg)	Total polyphenols (g/kg)	HPLC analysis (mg/kg)
ALG VAN	4.06±0.29^{a}	6.58±0.06^{a}	1.45±0.02^{b}	0.51±0.00^{e}	1.12±0.03^{c}	2267.91±17.56^{e}
ALG VAN 0.5% C	6.07±0.20^{b}	11.66±0.16^{b}	1.35±0.03^{a}	0.19±0.00^{a}	0.77±0.01^{a}	1379.29±2.53^{a}
ALG VAN 1% C	6.39±0.07^{c}	12.82±0.08^{c}	1.56±0.04^{c}	0.29±0.00^{d}	0.91±0.00^{b}	1833.26±9.85^{c}
ALG VAN 1.5% C	6.43±0.13^{c}	12.64±0.19^{c}	1.50±0.02^{b}	0.27±0.02^{c}	0.94±0.01^{b}	1885.71±15.00^{d}
ALG VAN 2% C	6.47±0.12^{c}	12.75±0.20^{c}	1.64±0.00^{d}	0.24±0.00^{b}	0.81±0.03^{a}	1600.12±10.49^{b}

ALG: alginate, VAN: vanillin, C: chitosan. Within the column, means followed by superscript different letters are significantly different at $p \leq 0.05$ (ANOVA, Fisher's LSD).

DISCUSSION AND CONCLUSIONS

Results showed that the addition of chitosan (0.5%, 1%, 2% and 3%) caused a decrease in vanillin concentration determined using the HPLC method compared to a sample containing only alginate as wall material. However, chitosan addition caused an increase in antioxidant activities, which were determined spectrophotometrically since chitosan enhances antioxidant activity. Formulated hydrogel beads are potential delivery systems of vanillin and could be used as an ingredient in functional foods as all components used in their preparation are nutritionally rich and safe for consumption.

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