Encapsulation of *Asparagus* extracts into polymeric nanoparticles for therapeutic purposes

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Introduction

Plant extracts presents important medicinal properties such as antioxidant and anti-genotoxic, however, its direct application has been limited mostly due to instability during storage (temperature, light, pH, oxygen). Furthermore, to obtain plant extracts, organic solvents are often used, making it undesirable for administration. Considering this, the encapsulation of plant extracts into polymer nanoparticles is a good approach to avoid such problems due to their biocompatibility, biodegradability and controlled release properties [1]. Thus, the aim of this study is to encapsulate an *Asparagus* aqueous extracts into poly lactic-co-glycolic acid (PLGA) nanoparticles for exploitation of its therapeutic properties.

Material and Methods

Plant material and preparation of extracts: Roots and spears of *Asparagus* were dried and grounded. Then, 1 g of the powder was added to distilled water and boiled. After decoction, the extracts from the roots (DR) and the spears (DSP) were freeze-dried. The total phenolic content and antioxidant activity of DR and DSP were investigated using a described methodology [2].

Nanoparticle productions and characterization

The DR and DSP extracts were separately encapsulated into PLGA nanoparticles using a solvent-evaporation double emulsion method previously described [3]. The particle size, polydispersity index (PDI) and zeta potential of nanoparticles were evaluated. The antioxidant activity was measured by the DPPH method, and the encapsulation efficiency (EE) for each extract was determined by the quantification of the total phenolic content (TPC).

Results

As shown in **Table 1**, a variation in the TPC content and antioxidant capacity results was observed between the extracts. The higher antioxidant activity was related with higher TPC values. The nanoparticles characteristics are shown in **Table 2**. A small size particle and PDI values close to 0.1 were find in both formulations. A PDI values around 0.1 indicates a homogenous and mono-dispersity and hence a better particle size distribution [4]. The values of zeta potential were -37 and -41 for DR and DSP respectively, demonstrating a good colloidal stability [5]. Both extracts presented an EE superior of 50%, which is a good achievement for aqueous plant extracts.

Conclusion

The results showed that *Asparagus* is a source of antioxidant compounds. It is foreseen that its encapsulation into polymeric nanoparticles can potentiate the therapeutic benefits of *Asparagus* extracts for multiple health conditions and for administration by different administration routes

References

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Tables

Table 1: Total phenolic contents (mg GAE/g) and antioxidant activity (TEAC, µmol TE/g) of *Asparagus* extracts.

	DR	DSP
TPC	81.19±3.33	31.93±0.41
DPPH	207.8±1.2	93.23±1.51

Table 2: Particle size, polydispersity index, zeta potential, and entrapment efficiency (EE) of *Asparagus* nanoparticles

	Size (nm)	PDI	Zeta Potential (mV)	EE (%)
PLGA DR	263.2±3.00	0.17±0.02	-37±4.42	74.72±2.70
PLGA DSP	225.8±13.54	0.14±0.01	-41.7±4.64	52.20±3.41