Zanthoxylum tingoassuiba essential oil loaded into lipid and chitosan particles

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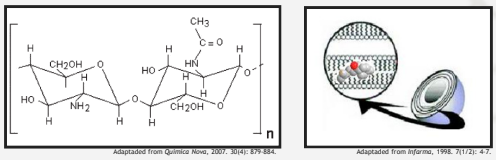
Introduction

Zanthoxylum tingoassuiba (Rutaceae) is a plant that has been used in traditional medicine of some Brazilian regions as anti-inflammatory, antifungic and antibacterial agent. The essential oil (EO) of this plant has a high amount of substances and one of them is α-bisabolol, that has well known antimicrobial properties [1]. EO are volatile, natural, complex mixture of compounds formed by aromatic plants as secondary metabolites [2].

However EO have a high content of terpenes easily prone to oxidation and resification [3]. In addition, oils have a low solubility in aqueous media, limiting their medical and pharmaceutical applications. So, several approaches have been proposed to greatly improve their solubility, stability and efficacy of EO-based formulations.

One promising approach to overcome this drawback is to encapsulate the EO in drug delivery system, such as lipid and chitosan particles.



Adaptaded from *Química Nova*, 2007. 30(4): 879-884. Adaptaded from *Inforna*, 1998. 7(1/2): 4-7.

Figure 1. Chemical structure of chitosan and illustration of liposome entrapping EO.

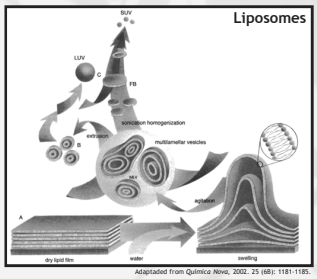
Objectives

Entrap *Z. tingoassuiba* EO into lipid and chitosan particles.

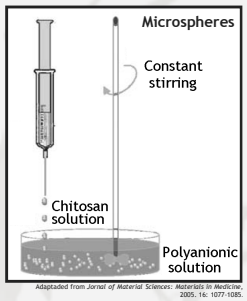
Characterize the formulations.

Experimenthal Methods

Preparation



Adaptaded from *Química Nova*, 2002. 25 (68): 1181-1185.



Adaptaded from *Jornal of Material Sciences: Materials in Medicine*, 2005. 16: 1077-1085.

Characterization

Size - PSC (liposomes) and milimetric scale (microspheres)

Morphology - Scanning Electron Microscopy (SEM)

Incorporation efficiency - HPLC with UV detection

Results and Discussion

The analysis of the essential oil by ^{13}C and ^{1}H NMR and Mass Spectrometry showed that the oil composition is a mixture of mono and sesquiterpenoids, being methyl N-methyl anthranylate and α-bisabolol the main constituents. The *Z. tingoassuiba* essential oil was analyzed by HPLC with UV detection, as depicted in Figure 1.

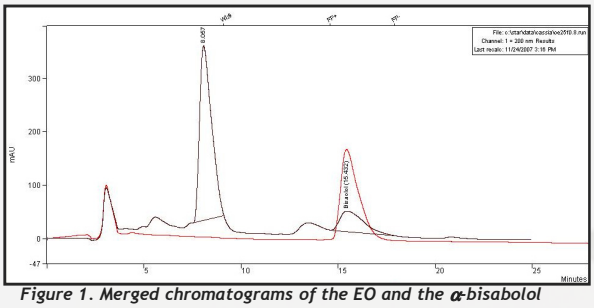


Figure 1. Merged chromatograms of the EO and the α-bisabolol standard.

The lipid particle entrapping EO showed a good sphericity as observed by microscopy and a monomodal distribution with a mean diameter described in table 1.

In all the formulations, the chitosan particles showed spherical shape and variable mechanical strength. The mean diameter of chitosan particles is also described in table 1.

Table 1. Mean diameter of liposomes and chitosan particles.

Liposomes			Microspheres
MLV	LUV	SUV	
3.57 ± 0.31 μm	1.38 ± 0.84 μm	0.26 ± 0.03 μm	1.12 ± 0.05 mm

The chitosan particles [4] and the liposomes showed a good capability of entrapping the essential oil (table 2). The incorporation efficiency varied with the preparation technique. The values that are shown in the Table 2 for the liposomes are just for MLV. LUV and SUV values were lower (data not show) but they are still according with other studies. These results confirm the efficacy of the process of entrapping volatile lipophilic substances and justify our intending for encapsulating *Z. tingoassuiba* essential oil in chitosan particles in other preparations.

Table 2. Entrapping the EO efficiency.

Liposomes	Microspheres
47 ± 6%	98.61 ± 0.22%

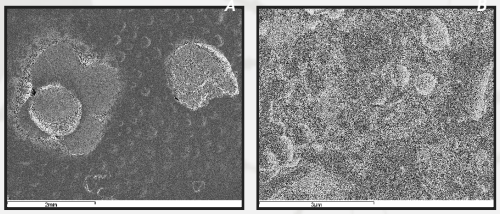


Figure 2. SEM micrography of: *A* - Chitosan particles; *B* - Liposomes.

Conclusion

These results demonstrated that α-bisabolol was successfully incorporated in lipid and chitosan particles. These kind of carriers particles can be useful to prepare formulations with volatile compounds, as the essential oil from *Z. tingoassuiba*. So the essential oil entrapped into lipid and chitosan particles seems to be a promising and suitable delivery system for pharmaceutical and medical applications.

References

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