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Development and characterization of electrospun nanofiber containing passion fruit (*Passiflora edulis*) seed oil for cosmetic applications

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Introduction:

Electrospinning is a technique used to create micro and nanofiber. The material has good characteristics for skin administration and can be used as a delivery system for cosmetic ingredients.

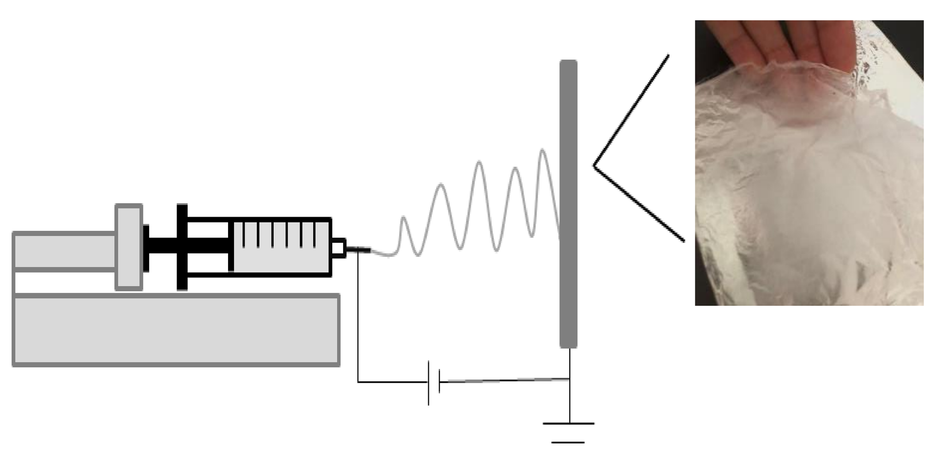

Fig. 1: Schematic model of electrospinning apparatus.

- ✓ High surface/volume ratio;
- ✓ Strength;
- ✓ Flexibility;
- ✓ Efficient permeability for water and oxygen;
- ✓ High capacity to incorporate bioactives.

Improving performance and stability of cosmetic products through new delivery systems is promising. Nanofibers are functional materials, capable of carrying actives and sustaining their release, in addition to protecting them from degradation. Thus, the purpose of this work was to develop and evaluate the morphology of an electrospun nanofiber containing passion fruit seed oil, aiming cosmetic applications.

Materials & Methods:

Polymeric solution preparation

A solution containing 8% ethyl cellulose (EC) and ethanol/acetone (1:1) was magnetically stirred for 24 hours. Then, 3% of passion fruit seed oil was added to the solution and magnetically stirred for 20 minutes.

Electrospinning

The electrospinning system consisted of a 20mL syringe connected to a 0.60mm diameter needle, an infusion pump, a high voltage source and a grounded collector plate covered with aluminum foil. The table bellow shows the electrospinning parameters used in this work.

Polymer	8% ethyl cellulose
Bioactive ingredient	3% passion fruit seed oil
Solvent	Ethanol/acetone
Flow rate	1 mL/hour
Voltage	10 kV
Distance between needle and collector	12 cm

Analysis of electrospun fibers

A field emission gun scanning electron microscope was used to evaluate the material microstructure. Fibers average diameters were measured using the software Image J.

Results & Discussion:

Electrospinning

The electrospinning of the solution formed a visible, very thin, and uniform membrane in the collector, indicating fiber formation.

Morphological characteristics

Through SEM images we observed that EC/passion fruit seed oil nanofiber were successfully obtained, with the formation of a three-dimensional structure, composed of continuous, fine and cylindrical fibers (Fig.2). The nanometric scale of the material was confirmed, with the fiber's average diameter of 167 ± 59nm (Fig.3).

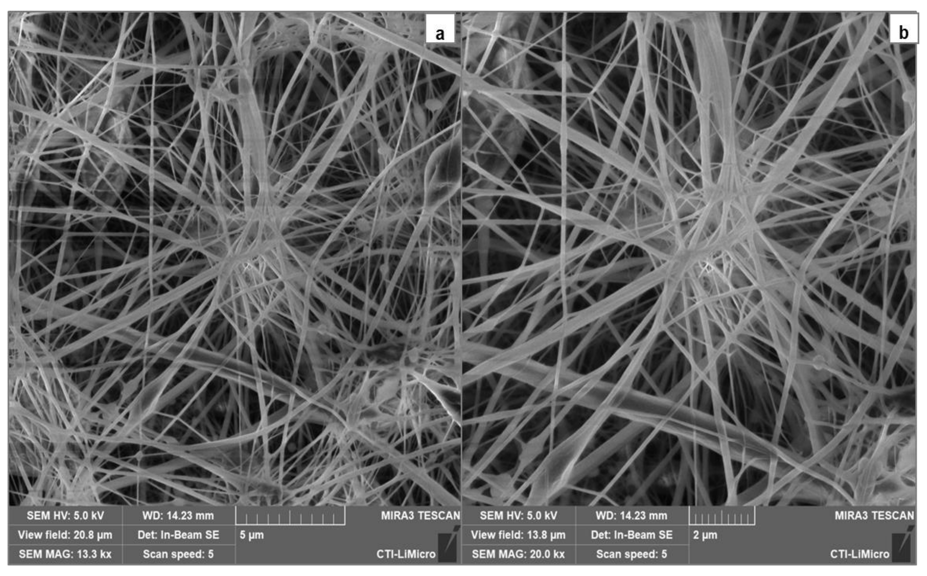

Fig. 2: Scanning electron microscopy of ethyl cellulose nanofiber with passion fruit seed oil.

The hydrophobicity of the material is interesting because allows the maintenance of its structure in humid environments. Using this material as a foot mask in cases of xerosis could provide protection against infections and water loss and, concomitantly, deliver the benefits of passion fruit oil.

Passion fruit seed oil is an useful ingredient for skin applications as it has a high content of linoleic acid. This oil can contribute to the skin's barrier properties and improve its hydration. In addition, it is known to have skin healing, tissue repair and antimicrobial properties.

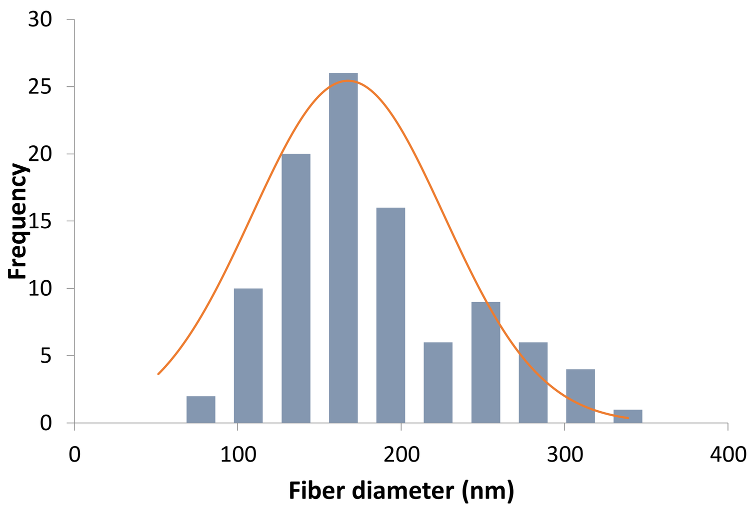

Fig. 3: Histogram of fibers diameters and frequency of occurrence observed for the biomaterial obtained with ethyl cellulose and passion fruit seed oil.

Conclusions:

This work demonstrated the feasibility of using electrospinning to produce ethyl cellulose nanofibers containing passion fruit seed oil. This material could be used to improve skin barrier function in conditions of skin dryness and barrier disruption, such as xerosis. Its presentation as a new vehicle, both cosmetic and dermatological, is very promising as it can solve compatibility issues, can carry bioactive compounds and sustaining their release, as well as protecting them from degradation. We believe this material has the potential to enhance the benefits of cosmetic actives and increase product stability.

Aknowledgments:

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