P-60 - Characterization and ecotoxicity evaluation of chitosan/tripolyphosphate nanoparticles loaded with different essential oils

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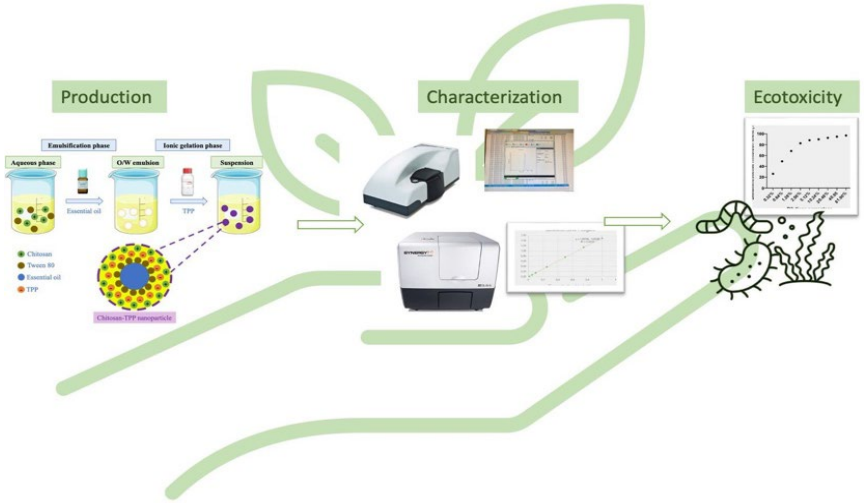
Essential oils (EOs) are botanical products extracted from medicinal and aromatic plants, which are constituted by volatile hydrophobic compounds exhibiting varied biological activities such as biopesticidal properties1. Chitosan is a polysaccharide with cationic nature and high potential to encapsulate natural ingredients. Electrostatic interactions between the cationic chitosan (protonated amine groups) and polyanions like tripolyphosphate (TPP) can be considered as an efficient polyelectrolyte complex to encapsulate EOs2. Therefore, the objective of this study was to encapsulate Anethum graveolens, Coriandrum sativum, Satureja montana and Thymus vulgaris EOs into chitosan/TPP nanoparticles via the ionic gelation technique. The particles encapsulating the EOs were characterized regarding their physicochemical and structural properties through DLS (Dynamic Light Scattering) and UV-vis spectroscopy during 30 days of storage. A first screening of the ecotoxic potential of the formulations was performed through the Microtox☐ Test using the bioluminescent bacteria Aliivibrio fischeri. Nanoparticles with average sizes ranging from 188 to 210nm and surface charge between +28 to +35 mV, respectively, were physically stable throughout storage at 4ºC. The EOs encapsulation efficiency (EE %) was high for the 4 EOs tested (86 to 97%). Despite having less toxicity than EOs loaded nanoparticles prepared from a concentration of 4.76 mg of EO/mL, empty chitosan/TPP nanoparticles (4.76 mg/mL of chitosan) also showed some toxicity through the Microtox Test. Other ecotoxicity tests will be carried out to assess the nanoformulations´ potential hazard towards different non-target organisms. Chitosan/TPP nanoparticles are a suitable, stable, and high-efficient nanocarrier.



Brief scheme of the different work phases.

References

1. Ahmadi Z, Saber M, Akbari A, Mahdavinia GR. Ecotoxicology and Environmental Safety. 2018;161:111-119.
2. di Santo MC, D' Antoni CL, Domínguez Rubio AP, Alaimo A, Pérez OE. Biomedicine and Pharmacotherapy. 2021;142.

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