XXV ENCONTRO NACIONAL

Sociedade Portuguesa de Química

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Microencapsulation of *Ammodaucus leucotrichus* essential oil using chitosan/ TPP/vanillin chemical system

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A. leucotrichus (Coss. & Dur.) Coss. & Dur., known in Algeria as “Kammûnes-sofi”, is a medicinal plant that finds culinary use by indigenous populations. Among others, it is used against stomach pain, indigestion, diarrhea, vomiting, fever, and to combat high blood pressure. In this work, the essential oil of *A. leucotrichus*, obtained by steam distillation (3h) from fruits collected in March 2015 from Tassili n'Ajjer, a vast plateau in south-east Algeria (25°30'0" N and 9°0'0" E), was chemically and biologically characterized and thereafter microencapsulated using a chitosan/TPP/vanillin system. Chemical characterization allowed the identification of ten constituents representing 98.6% of the whole essential oil composition. Oxygen-containing monoterpenes (87.2 %) were found to be the main group of components, followed by monoterpene hydrocarbons (11.1 %) and oxygen-containing sesquiterpenes (0.35 %). Perilla aldehyde was identified as the main component present in the essential oil accounting for 85.6 % of the total composition. Additionally, the oil presented antioxidant (EC_{50} 28±2 mg/ml, concentration able to scavenge 50% of DPPH radicals), anti-inflammatory (EC_{50} 11.7±0.7 µg/ml, concentration able to inhibit 50% of NO formation) and antimicrobial (against *Escherichia coli*: minimum inhibitory concentration (MIC) 10 mg/ml and minimum bactericidal concentration (MBC) 10 mg/ml; against *Staphylococcus aureus:* MIC 20 mg/ml and MBC 20 mg/ml) activities.*A. leucotrichus* essential oil microparticles were produced using an atomization/coagulation technique with chitosan as the shell material, sodium tripolyphosphaste (TPP) and vanillin as crosslinking agents. Comparatively to the most used chemical systems, this one presents several advantages since all the raw materials are nontoxic and no organic solvents are required. Moreover, the used microencapsulation process allows the microparticles production in a single step, without having the constrains of the traditionally used oil-in-water (o/w) emulsion based techniques. The adopted procedure comprises the following stages: (1) Chitosan solution (CS) preparation (3.0%, w/v) in acidic medium (acetic acid 3%, v/v); (2) Oil-in-water (o/w) emulsion preparation by emulsifying the essential oil (O) with the chitosan solution at O/CS ratio of 0.025 (v/v) with Tween 80 (emulsifier of HLB=15.0, 1.5%, w/v). The emulsion was homogenized at 11000 rpm during 5 min with a CAT Unidrive X homogenizer; (3) Atomization of the o/w emulsion in a Nisco VarJ30 system (flow rate: 0.3 ml/min) under pressurized nitrogen; (4) Coagulation with TPP (10%, w/v at pH 6.0) followed by vanillin crosslinking (1.0% (w/v), 50ºC at 0.5 ml/min during 2 h). Microparticles were recovered by filtration under reduced pressure, washed with distilled water and stored in the hydrated form.The produced microparticles were preliminary analyzed by optical microscopy (OM) using a Nikon eclipse 50i microscope to access size and morphology. This analysis showed the presence of spherical and individualized structures with an estimated particle size between 15 and 75 µm. Moreover, microparticles chemical structure was analyzed by FTIR, the thermal degradation was evaluated by TG and microparticle size distributions were measured by laser diffraction. The results shown the production of viable microparticles, indicating that the chitosan/ TPP/vanillin chemical system is a feasible alternative for a green *A. leucotrichus* essential oil encapsulation, when the atomization/coagulation technique is used. Moreover, taking into account the antimicrobial activity of *A. leucotrichus* essential oil, the produced microparticles can be a good alternative for cosmetic application as preservative.

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