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A NANOSPHERICAL DENDRIMERIC GALLATE ESTER FOR LONG TERM PRESERVATION OF ESSENTIAL OILS: AN INTEGRATED CHEMOMETRIC ASSISTED FT-IR STUDY

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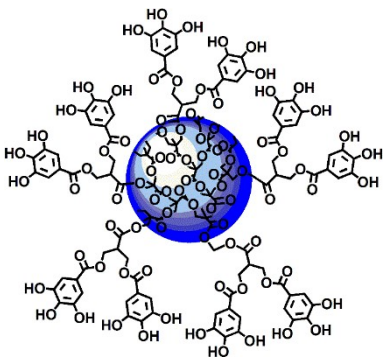
Essential oils (EOs) are hydrophobic concentrated liquids from plants made of volatile chemical compounds. EOs are very popular in the food, cosmetic and pharmaceutical industry as aromas, fragrances and alternative therapeutic devices [1, 2]. EOs are susceptible to degradation reactions, especially of oxidative type, triggered by temperature, light and oxygen availability. A loss of quality and alterations of sensory and pharmacological properties may occur, causing the production of smelly or even harmful compounds, responsible for allergic reactions and skin irritation [3-5]. For preventing and delaying EOs' spoilage, synthetic preservatives as 2,6-*bis*(1,1-dimetiletil)-4-metilphenol (BHT) or *t*-butil-4-hydrohyanisole (BHA) are commonly adopted; but, in addition to a limited efficiency due mainly to poor solubility in oils, they may cause health diseases [6]. Natural polyphenols as gallic acid (GA) are nowadays proposed as safer alternatives, but their efficiency is limited by their low compatibility with hydrophobic material again, or by the occurrence of probable side reactions with oils constituents. Recently, a hydrophobic and biodegradable GA-enriched dendrimer (GAD) (Fig. 1.a) characterised by a nanospherical morphology (Fig. 1.b) and endowed with a remarkable antioxidant activity was synthetized [7]. Further studies currently being completed, have shown that GAD, with respect to free GA, possesses also more efficient antibacterial properties against several antibiotics-resistant G+ strains, inhibits platelet aggregation and ROS accumulation thus representing an excellent alternative to conventional drugs to combat infections and thrombus formation [8]. In this study, based on integrated results obtained from the due investigations, GAD is advised also as an innovative and semi-synthetic preservative additive.

a)



b)

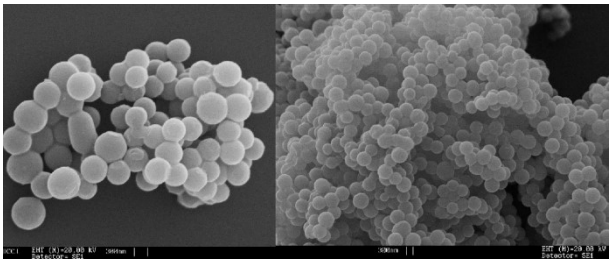


Figure 1. Intuitive representation of GA-enriched dendrimer (GAD) structure (a); SEM images of GAD spherical nanoparticles (b). Scale bars represent 300 nm.

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In this regard, GAD proved a much more efficient preservative power than free GA and, unlike GA, it never acts as a pro-oxidant. Besides classic oxidation indexes, the desired information was obtained by FT-IR spectroscopy assisted by multivariate analysis (MVA). For further confirmation of the so obtained results, interpretations of FT-IR data by considering the area of some selected informative bands and iodometric titrations to determine the hydro peroxide value (PV) were also performed [9].

References

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