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Preparation of microcapsules using sodium alginate. Friendly environment route to extract the orange oil.

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Essential oils derived from plants have great industrial applications. Orange essential oil, ?Citrus sinensis, has been widely recognized for its beneficial properties for health and other uses such as cosmetics, food, pharmaceuticals, and agriculture. Citrus fruits exhibit potent antimicrobial and fungicide properties, making them an attractive choice for controlling pathogens in food and disease in crops. However, volatilization of active components, exposure to high temperatures, oxidation, and UV light can lead to the loss of the essential oil's biological properties, restricting its extended use. Microencapsulation could be a solution to both manage the release of the oil and protect it from the external environment. The ionic gelation technique, commonly employed in microencapsulation, enables the dispersion of hydrophobic components in an aqueous solution with biopolymers, such as sodium alginate, that can protect the essential oil. Therefore, this study aims to produce sodium alginate microcapsules as a polymer matrix for the prolonged use of orange essential oil. The microcapsules were prepared using the ionic gelation technique, where a calcium chloride (CaCl2) solution was used. The orange essential oil extraction and quantification were carried out using ethanol as a solvent due to environmental concerns associated with other solvents like hexane or methanol. First, sodium alginate was dissolved in distilled water, and three proportions of orange essential oil were added. A syringe pump was handled to produce the microcapsules; then, they were removed and rinsed twice with distilled water. Finally, the samples were lyophilized for 18 hours. The microcapsules were characterized by FTIR Infrared Spectroscopy to identify the functional groups of the essential oil and sodium alginate. Likewise, ultraviolet light spectroscopy (UV visible) was used to determine the concentration of oil released in ethanol from plotted a standard curve. The concentration was determined twice before and after the sonication process for 10 min at 70% amplitude. Afterward, scanning electrons and an optical microscope were used to study the morphology of the microcapsules. The results showed the presence of the encapsulated oil. In addition, it was possible to determine the concentrations of the essential oil encapsulated in three proportions using ethanol as a solvent.