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Synthesis of peppermint oil microcapsules to be used as a digestive supplement

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Peppermint oil (PO) has valuable medicinal properties such as high antioxidant activity and is used to treat numerous diseases including irritable bowel syndrome and indigestion. However, it is sensitive to light and heat. Furthermore, it could cause heartburns during its passage through the stomach. Therefore, the objectives of this research were to make microcapsules of PO, which can help to overcome the fore stated complications. PO microcapsules that are stable under acidic pH of the stomach can be taken as a dietary supplement. PO microcapsules were synthesized by complex coacervation method using gelatin and gum acacia wall materials. Formaldehyde was used to make cross links between gum acacia and gelatin to increase the stability of the wall. Gelatin enteric coating was used to further increase the strength of the microcapsule wall. Morphology of the synthesized microcapsules was studied using the optical microscope and was found to be spherical. Encapsulation of PO was confirmed by the UV-Visible spectra of mechanically crushed microcapsules. Antioxidant capacities (AOC) of the encapsulated PO were assessed using the Folin-Ciocalteu reagent and were found to be 33.3 (±7) mg pyrogallol equivalents (PGE)/g and 38.7 (±1) mg PGE/g for gelatin coated and non-coated microcapsules respectively. In order to assess the stability of the microcapsules, they were subjected to acidic conditions similar to the stomach and the resulting microcapsules and the acidic solutions were analyzed for their AOC. It was found that only 4-9% of active PO was lost from the microcapsule during the acidic treatment, hence indicating the capacity of PO microcapsules to significantly retain the encapsulated PO. After subjecting to acidic conditions similar to the stomach, the gelatin coated and non coated microcapsules retained 91% and 96% of active PO respectively. Pure PO directly added to the acidic solution displayed a loss of 44% of AOC, hence signifying the extra stability of microencapsulated PO. The acid treated PO microcapsules were then subjected to conditions similar to the intestine by treating with neutral solution in the presence and absence of a protease enzyme (Bromelain). In the absence of the enzyme, both gelatin-coated and non-coated microcapsules indicated 3-5% release of active PO to the solution. In the presence of the protease, both types of microcapsules indicated 8-18% release of active PO. This ensures the enhanced release of encapsulated PO inside the intestine in the presence of digestive proteases that can digest the microcapsule wall, similar to bromelain.

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