Screening of Electrospray-operating Parameters in the Production of Alginate-Royal Jelly Microbeads Using Factorial Design

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Abstract

Introduction: Royal jelly (RJ) has been consumed as food or as a supplement because of its high nutritional and medicinal values. A fresh harvested RJ is yellowish to whitish in color and contains proteins, free amino acids, lipids, vitamins, and sugar. Without proper storage conditions, such as at 4 degrees C, the color of RJ changes to much darker yellow and produces a rancid smell. To prolong its shelf life, RJ is usually mixed with honey. Alginate, a natural and edible polymer derived from seaweed, is commonly used to encapsulate drugs and food due to its ability to form gels by reacting with divalent cations. However, there is a lack of research on the microencapsulation of RJ in alginate using electrospray. The electrospray technique has the advantage in producing consistent size and shape of alginate microbeads under optimum parameters. Aim: This research aimed to optimize electrospray-operating parameters in producing alginate-RJ microbeads. Materials and Methods: Optimization of alginate-RJ microbeads electrospray parameters was carried out using 24 factorial design with three center points (19 runs). The studied parameters were flow rate, high voltage, nozzle size, and tip-to-collector distance, whereas the responses were particle size, particle size distribution, and sphericity factor. The responses of each run were analyzed using Design-Expert software. Results: Nozzle size is a significant parameter that influences the particle size. Flow rate is a significant parameter influencing the sphericity factor. Conclusion: Screening of the electrospray-operating parameters paves the way in determining the significant parameters and their design space to produce consistent alginate-RJ microbeads.

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