



University of Zabol  
Management of graduate education  
Faculty of Agriculture  
Department of Food Science and Industry

The Thesis Submitted for the Degree of Master of Science  
(In the field of Food industry science and engineering)

**Title:**

Encapsulation Momordica Charantia fruit Extract by Multilayer Protein  
System: Characterization and its application

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## Abstract

Improper diet is one of the known reasons for the spread of diseases such as type 2 diabetes. The use of plants with therapeutic properties such as Bitter Melon in making dietary products can be effective in controlling blood sugar, but the bitter taste of this plant limits its use. In this research, Bitter Melon fruit extract (1, 2, 3 and 4% (volume/volume)) was micro coated using a protein multilayer system (zein and gelatin polymers) and electrospinning using the sandwich method. In order to check the characteristics of the system The prepared protein multilayers were subjected to microstructure analysis tests using scanning electron microscopy, Fourier transform infrared spectroscopy, gravimetric calorimetry, contact angle, X-ray diffraction, tissue profile analysis and micro coating efficiency. Viscometer and electrical conductivity of polymer solutions were also investigated. The release of Bitter Melon extract from the multi-layered protein system was studied under the influence of gastric and intestinal pH, and the results were analyzed in the form of a completely randomized design.

**Keywords:** Electrospinning, Polyphenolic Compounds, Bitter Melon, Protein Multilayer System