



University of zabol  
Management of graduate school  
School of Agriculture  
Department of Food Industry Science and Engineering

**Thesis for master's degree  
in the field of science and food industry engineering, biotechnology  
orientation**

**Investigating the characteristics and antimicrobial properties  
of gelatin nanofibers containing lavender essential oil**

**Supervisors:**

Dr. Mohammad Ali Najafi

Dr. Mohammad Amin Miri

**Advisor:**

Sara Najafi Qaghelestani

**By:**

Ehsan Sadeghi Hamzekhani

May ۲۰۲۳

## **Abstract**

Lavender plant is one of the medicinal species that has effects such as relieving asthma, treating old wounds, treating nausea, healthy skin and hair, strengthening the stomach, cleansing the liver, and also antimicrobial properties. In the present study, lavender essential oil was encapsulated in the amounts of 1, 2.5, 5 and 10% (V/V) in gelatin electrospinning nanofibers. Nanofibers containing lavender essential oil were characterized by XRD, TGA, FTIR and SEM. The morphology and diameter of electrospun nanofibers were measured with the help of scanning electron microscope and the diameter of nanofibers was measured using Image J software. Also, the antimicrobial properties of nanofibers were investigated by disc diffusion method on *Bacillus cereus*, *Escherichia coli*, *Salmonella typhimurium* and *Staphylococcus aureus* bacteria. GC-MS analysis was performed to identify chemical compounds of lavender essential oil. The diameter of nanofibers obtained from electrospinning of gelatin increased with increasing concentration of lavender essential oil. The physical state of lavender essential oil in electrospun gelatin nanofibers was about 99.5%. The results of the antimicrobial test showed that lavender essential oil loaded in electrospun gelatin nanofibers at a concentration of 10% showed its best performance. Lavender essential oil was successfully encapsulated in carrier nanofibers from gelatin electrospinning for the first time. This research showed the use of electrospinning method as a new encapsulation method and edible polymer to encapsulate bioactive compounds.

**Keywords:** lavender, electrospinning, antimicrobial