

## **Abstract**

### **Introduction:**

Many factors cause destruction and dysfunction of the skin and even cause infection. Today, researchers are looking for the design and production of films containing antimicrobial substances that have suitable physicochemical properties, and at the same time, with the appropriate release of antimicrobial substances, they show the ability to cover and apply appropriate antimicrobial properties, which is considered a necessity in wound healing. Plant essential oils, especially essential oils of Ajwain, as well as natural materials such as cellulose and chitosan in Nano form, which have antimicrobial and wound healing properties, can be a suitable material for use in the structure of these types of films.

### **Method:**

First, Ajwain essential oil was prepared and its contents were evaluated. Then nanochitosan was prepared and nanocellulose was prepared by solvent exchange. After preparing PLA films incorporated with different concentrations of nanocellulose, nanochitosan, and ajwain essential oil, the appearance, and thickness of the films, the rate of release of essential oil, and the in-vitro antimicrobial properties of these films were evaluated and the films with higher antimicrobial properties was used to dressing the wounds of rats. After evaluating the wound healing properties, the mechanical properties and SEM of these films were analyzed.

### **Findings:**

The results obtained in this study showed that thymol, para-cymene, and gamma-terpinene were the main components of ajwain essential oil. All prepared films have antimicrobial properties against the studied pathogens bacteria, especially gram-positive bacteria. Finally, PLA films incorporated with 4% nanochitosan and 3% ajwain essential oil showed the highest antibacterial and wound healing properties. According to the results obtained in the tensile strength test, the nanocomposite films had good strength and nanochitosan improved the mechanical properties of the films.

### **Conclusion:**

According to the results obtained in this study, the PLA films incorporated with nanochitosan and ajwain essential oil can be a suitable option for new wound dressings.

**Key words:** Trachyspermum ammi, PLA, Film, nanochitosan, nanocellulose