



University of Zabol

Title:

**Fabrication of functional nanofibers containing *Withania coagulans* extract:
characterization, antimicrobial properties, blood sugar control**

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Abstract:

The purpose of this research is to produce useful nanofibers containing *Withania coagulans* extract, to find characteristics, to investigate the physicochemical, antimicrobial, and blood sugar control properties of these nanofibers. For this purpose, we prepared a solution containing chitosan powder and polyethylene oxide in 80% acetic acid solvent and adding Alcoholic extract of *Withania coagulans* fruit, concentrations of 2.5, 5 and 10% (volume/volume) of *Withania coagulans* extract were prepared and by conducting SEM-XRD-TGA-FTIR-AFM-CA-BET tests, the physicochemical characteristics of nanofibers and using We investigated the antimicrobial properties of nanofibers using the microdilution method, and by adding nanofibers containing the extract to the food of laboratory rats in which diabetes was induced by streptozotocin (40 mg/kg body weight), the blood sugar control property of the produced nanofibers was investigated. The results of the experiments show that the diameter of nanofibers (141.4 nm) increased with the addition of extract (146.2). The average surface roughness of nanofibers containing extract (216.9) decreased compared to nanofibers without extract (615.2). The absence of change in the location of the peaks and the shifting and sharpening of the peaks in the Fourier Transform Infrared (FTIR) spectroscopy diagram confirm the successful loading of the extract in the nanofibers. The analysis of TGA results shows that in the nanofibers containing and without extract, major changes occur in the temperature range of 25 to 220 degrees Celsius. X-ray diffraction (XRD) test shows two peaks at angles of about 9 and 19.5 degrees, and the highest peak and degree of crystallinity It is related to the sample without extract. The decrease in the water contact angle ($\theta > 90$) of the nanofibers containing the extract confirms the increase in the hydrophilicity of the nanofibers containing the extract. Absorption and reabsorption isotherm of nanofibers, the presence of holes with a size of 10.3 to 12 nm (mesopores) in nanofibers containing extract, the average size of holes in nanofibers without extract (12 ± 3.09) than nanofibers containing extract (10.3 ± 2.03) more and the average volume of holes in nanofibers containing extract (0.025) is less than nanofibers without extract (0.013) and based on the hardness test of nanofibers containing 10% extract (198.55) more than nanofibers without extract (59) /158) is Based on the toxicology test, the nanofibers contained in *Withania coagulans* extract do not have a growth inhibitory effect on normal human cells, but they can inhibit the growth of two bacteria, *Staphylococcus aureus* and *Escherichia coli* in a laboratory environment, and also have a significant effect ($P < 0.05$) on the control of sugar levels. The blood of diabetic rats after the end of the 21st period has been tested, and these parameters can make the beneficial nanofibers contained in *Withania coagulans* fruit extract a suitable candidate for maintaining the safety level of food and increasing the health-giving properties of food by controlling the blood sugar level in diabetic patients.. It is suggested to use nanofibers containing *Withania coagulans* extract in the simulated environment of the stomach and different foods and to investigate its shelf life and effectiveness.

Key words: useful nanofibers, *Withania coagulans* extract, characterization, antimicrobial properties, blood sugar control