



**University of Zabol
Graduate School
Faculty of Sciences**

Department of Biology

The Thesis Submitted for the Degree of Master of Science

(In the field of Genetics)

Title:

**Investigating of the zinc and iron nanoparticles effects
on MO-CBP3 gene expression in Moringa oliefera
medicinal plant**

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Abstract

Plants are a potential source for making medicinal compounds. One of these medicinal plants is *Moringa oleifera*, which is an important and original medicinal plant of the Indian subcontinent, belongs to the Moringaceae family of flowering plants of the genus *Moringa*. *Moringa oleifera* is a tree that grows widely in many tropical and subtropical countries. *MO-CBP3* is a chitin-binding protein from *Moringa oleifera* seeds and prevents the germination and growth of pathogenic plant fungi. This protein is very stable against heat and resistant to pH changes. *MO-CBP3* gene is particularly important due to its antimicrobial, antidiabetic and analgesic properties. The triggers of plant defense responses are divided into two categories depending on their source: exogenous and endogenous signals. Abiotic elicitors have a wide spectrum on plants and produce secondary metabolites. The use of non-living stimuli in plant cell cultures has received less attention compared to biological stimuli. Today, nanotechnology has been used in many fields such as industry, agriculture, trade, public health and medicine due to the application of nanoparticles. Iron is one of the low-use essential elements that plays a role in photosynthesis, respiration and nitrogen fixation. It is placed in the catalytic part of many oxidation and reduction enzymes and is needed for the synthesis of chlorophyll and RNA. Zinc plays an essential role in the metabolism of carbohydrates and proteins and controls plant growth hormones. Real Time PCR is one of the best gene expression techniques. The purpose of this research is to investigate the effects of iron and zinc nanoparticles on the expression of this gene in the medicinal plant *Moringa oleifera*. First, *Moringa oleifera* plant seeds were planted in pots in a completely random pattern in four fields and three repetitions. The treatment was applied at four concentrations of 0, 20, 40, 60 ppm, and RNA extraction from the plant leaf was done in two time periods of 24 and 72 hours after the treatment. Gene expression was studied by real time PCR technique. Data analysis was done using SPSS software. The results of real time PCR data analysis showed that gene expression increased with the increase of iron nanoparticle concentration and zinc concentration of 60 ppm. And the highest level of expression is related to the concentration of 60 ppm of iron and zinc nanoparticles and in a period of 72 hours, and a decrease in expression was observed at the concentration of 20 and 40 ppm.

Keywords: Iron nanoparticles, *MO-CBP3* Gene, *Moringa*, zinc nanoparticles