

## **Abstract**

*Marmordica charantia* is a medicinal plant of the Cucurbitaceae family, which has antibacterial, anti-cancer, anti-tumor, and lowering effect for glucose, cholesterol and blood pressure. metallic nanoparticles like Zinc Oxide nanoparticles greatly affect on the physiological properties of plants, such as seed germination, plant growth and metabolism. Chitosan is a herbal source of carbon and helps the root system of plants to absorb more food from the soil and thus stimulate the growth and metabolism of the plant. Jasmonate is one of the most important natural growth regulators that play a special role in plant responses to environmental stress and is effective in increasing of secondary metabolites production. In this research, the effect of ZnO nanoparticles (20, 60 and 100 ppm), jasmonate (100, 250 and 500  $\mu\text{m}$ ) and chitosan (10, 50, and 100  $\mu\text{m}$ ) on growth, physiological and biochemical properties such as: photosynthetic pigments amount, total protein, total sugars, proline and secondary metabolites on *Marmordica charantia* were measured. The results of this study showed that different parameters such as phenolic compounds, flavonoids, antioxidant enzymes, carbohydrates, proline content, lipid peroxidation and photosynthetic pigments significantly were increased under the influence of silver nanoparticles, chitosan and jasmonate. The amount of secondary metabolites, such as phenol and flavonoids was significantly increased at high concentrations of all three of these elicitors. The highest increase in antioxidant enzymes except guaiacol peroxidase enzyme was significantly increased at high concentrations of ZnO, chitosan and jasmonate. The highest carbohydrate content was observed at 100  $\mu\text{m}$  chitosan and 500  $\mu\text{m}$  jasmonate. The amount of proline was significantly increased in comparison with the control at 100 ppm ZnO, 100  $\mu\text{m}$  chitosan and 250  $\mu\text{m}$  jasmonate. Generally the highest levels of secondary metabolites and antioxidant enzymes were observed at high concentrations of zinc oxide, chitosan and jasmonate oxide nanoparticles.



**University of Zabol**  
**Graduate School**  
**Faculty of Science**  
**Department of Biology**

**The Thesis Submitted for the Degree of Master of Science**  
**(In the field of Plant Physiology)**

**Effect of different concentrations of ZnO nanoparticles,  
Jasmonate, Chitosan on growth and some physiological and  
biochemical parameters of *Momordica charantia***

**Supervisor:**

**Dr. Sedigheh Esmaeilzadeh Bahabadi**

**Advisor:**

**Dr. Alireza Samzadeh-kermani**

**Dr. Morteza Gholami**

**By:**

**Razieh Sharifi-Rad**

**Summer 2018**