



University of Zabol
Graduate school
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**The Thesis Submitted for the Degree of M.Sc (in the field of
plant physiology)**

**Effect of different levels of manganese
nanoparticles and manganese salt on
growth and biochemical parameters of
tomato (*Solanum lycopersicum* L)**

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Abstract

Based on recent nanotechnology approaches, nanoproducts have been proposed to solve food problems, increase the productivity of plant products, and reduce nutrient losses. Tomato (*Solanum lycopersicum L*) is one of the main sources of carotenoids and provides 80% of the daily requirement of lycopene, folate, ascorbic acid, flavonoids, tocopherol and potassium in the human diet. In this research, in order to investigate the effect of manganese nanoparticles and manganese salt on the morphological and biochemical characteristics of tomato plants, a factorial experiment was carried out in the plant physiology laboratory Faculty of Science University of Zabol during the crop year 1401. The experimental treatments included different concentrations of manganese nanoparticles and manganese salt (10, 25 and 50 mg/l) which were sprayed at the 4th, 6th and 8th leaf stages and after one growth season morphological parameters such as wet weight, organ length Aerial and root were measured. Also, biochemical traits including photosynthetic pigments, protein and antioxidant enzymes were measured by spectrophotometric method. The results showed that the increase in fresh weight, length of shoots and roots, the content of pigments, the amount of phenol, flavonoid, antioxidant activity (DPPH), protein and antioxidant enzymes at a concentration of 10 mg/l increased compared to the control, which resulted in an increase Photosynthesis and growth improvement. But the application of 50 mg/l is stressful and reduces growth and biomass. On the other hand, peroxidation of membrane lipids (MDA) and proline of tomatoes treated by nanoparticles and manganese salt, especially nanoparticles; In the optimal concentration (10 mg/l), compared to the control, they had the lowest amount, which indicates the reduction of oxidative stress and as a result the improvement of plant growth indicators, but increasing the concentration of the treatment solution to 50 mg/l caused the induction of oxidative stress and reduced growth. According to the results of this study, the use of manganese nanoparticles compared to manganese salt and in general at a concentration of 10 mg/l has had the best response and can be used as a stimulus to increase biomass and improve growth indicators.

Keywords: Antioxidant enzymes, Phenolic compound, Manganese nanoparticles, *Solanum lycopersicum*