



University of Zabol  
Management of graduate education  
Department of natural resources  
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Dissertation to obtain a master's degree in the field of agricultural  
biotechnology

**Comparison of the synthesis of zinc oxide  
nanoparticles and silver nanoparticles in  
different parts of the medicinal plant (*Caparis  
Spinosa* L) and investigating the antimicrobial  
and antioxidant properties.**

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## **Abstract**

The usual methods of nanoparticle synthesis have defects such as poor structure, low production rate, high production cost and high energy requirement. Therefore, nowadays, the tendency to use plant sources as one of the most appropriate methods of synthesis of nanoparticles has been noticed by researchers. The snake grass plant belongs to the Capparidacea family, it is a perennial plant that is known in Iran by the local names of snake grass, mountain watermelon, kur, kabar, lajagi, khayar sheng. This plant is one of the most important medicinal plants in Iran. And Pakistan is used to treat many diseases. Therefore, the purpose of this study was the possibility of synthesizing silver and zinc nanoparticles using the extract of leaves and stems of snake grass and investigating the antibacterial properties of the produced nanoparticles. For this purpose, an extract was prepared from the leaves and stems of this plant and nanoparticles were synthesized. Then the produced nanoparticles were characterized (UV-Vis, XRD, TEM and FT-IR) and the sensitivity of the strains of *Streptococcus pyogenes*, *Staphylococcus aureus*, *Hafnia eveli* and *Escherichia coli* to the synthesized silver and zinc nanoparticles was determined. . The results of this study showed that the production of nanometer-sized silver and zinc nanoparticles was spherical. The antibacterial effect of the synthesized nanoparticles showed that *Escherichia coli* and *Hafnia alevi*, which are Gram-negative bacteria, showed less sensitivity than the Gram-positive bacteria *Streptococcus pyogenes* and *Staphylococcus aureus*, and there was a direct relationship between the concentration of nanoparticles and inhibition of bacterial growth. Overall, the results indicated that the use of snake grass leaf and stem extracts can be introduced as an efficient biological method for the production of silver and zinc nanoparticles, and with further studies in this field, it may be possible to use the nanoparticles synthesized by the method Sabz was used as a suitable candidate in the treatment of microbial infections.

**Keywords:** green synthesis, leaf extract, antimicrobial, herbal