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Synthesis of iron nanoparticles from leaf extract of *Cressa cretica* and evaluation of its antimicrobial effects and its toxicity on germination of plant

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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. *Cressa cretica* L is a plant from the ivy family and has large amounts of flavonoids. Therefore, the purpose of this study was the possibility of synthesizing iron nanoparticles using ant grass leaf extract and investigating the antibacterial properties of the produced nanoparticles. For this purpose, an extract was prepared from the leaves of this plant and nanoparticles were synthesized. Then, the produced nanoparticles were characterized (UV-Vis, XRD, TEM and FT-IR) and the sensitivity of *Staphylococcus aureus* and *Escherichia coli* strains to the synthesized iron nanoparticles was determined. In addition, in order to investigate the effect of iron nanoparticles and their different concentrations (100 and 200 ppm) on the germination and growth stages of basil seedlings, an experiment was conducted in the form of a completely randomized design with three replications. The results of this study showed that the production of nanometer sized iron nanoparticles was spherical in shape. The antibacterial effect of synthesized nanoparticles showed that *Escherichia coli* bacteria showed less sensitivity than *Staphylococcus aureus* bacteria and there was a direct relationship between nanoparticle concentration and bacterial growth inhibition. Also, the treatment of iron nanoparticles had a significant effect on the characteristics of germination percentage, root length, seedling length and seedling length of basil plant at the probability level of 1%. In general, the results indicated that the use of ant grass leaf extract can be introduced as an efficient biological method for the production of iron nanoparticles, and with more studies in this field, it may be possible to use nanoparticles synthesized by the green method as It is a suitable candidate for the treatment of microbial infections.

Keywords: Green synthesis, Leaf extract, Antimicrobial, Phytotoxicity