

## Green Synthesis of AgNPs Using Medicinal Himalaya Fern (*Thelypteris Erubescens*): Structural Characterization, Effect on Seed Germination, and Antimicrobial Function

### Sadaf Kayani\*

Assistant Professor, Department of Biology, Faculty of Engineering and Natural Sciences, Süleyman Demirel University, 32260 Isparta, Türkiye.

Department of Botany Mohi-ud-Din Islamic University, Nerian Sharif-12010, Azad Jammu & Kashmir, Pakistan

### Tijen Demiral Sert

Department of Biology, Faculty of Engineering and Natural Sciences, Süleyman Demirel University, 32260 Isparta, Türkiye.

### Syed Abidulla

Department of Botany Mohi-ud-Din Islamic University, Nerian Sharif-12010, Azad Jammu & Kashmir, Pakistan

### Kamran Iqbal Shinwari

Department of Biology, Faculty of Engineering and Natural Sciences, Süleyman Demirel University, 32260 Isparta, Türkiye

### Salma Kousar

Department of Biology, Faculty of Engineering and Natural Sciences, Süleyman Demirel University, 32260 Isparta, Türkiye.

Department of Botany Mohi-ud-Din Islamic University, Nerian Sharif-12010, Azad Jammu & Kashmir, Pakistan

### Semra KILIÇ

Department of Biology, Faculty of Engineering and Natural Sciences, Süleyman Demirel University, 32260 Isparta, Türkiye.

### Abstract:

The green synthesis of silver nanoparticles (AgNPs) is a promising alternative to nanotechnology due to its stable, non-toxic, and eco-friendly approach. One such novel approach is the use of medicinal plants for the synthesis of AgNPs. In this study, the medicinal Himalayan fern *Thelypteris erubescens* was used for the green synthesis of AgNPs, and its effects on seed germination of maize and antimicrobial properties were investigated. AgNPs from *Thelypteris erubescens* were synthesized by adding silver nitrate to plant extract and the synthesis of AgNPs was validated and characterized through ultraviolet spectroscopy (UV), scanning electron microscopy (SEM), and X-ray diffraction (XRD). AgNPs of varying concentrations displayed antibacterial and antifungal activity through agar well diffusion. *Thelypteris erubescens* nanoparticle synthesis demonstrated superior antibacterial efficiency compared to methanol and aqueous extracts. The application of AgNPs derived from *Thelypteris erubescens* stems significantly enhanced maize seed germination, surpassing traditional methods. Silver nanoparticles have been proven to enhance plant growth and seed germination ability at controlled environment. This eco-friendly and cost-effective approach maximizes the effects of growth-regulating hormones and exploits plants' potential against microbial strains.

### Keywords:

Nanoparticles, Green synthesis, Pteridophytes, AgNPs.