

Antibacterial Potential of Natural Products

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ABSTRACT

The study of medicinal plants has attracted a lot of attention lately because of their potential use as natural medicine and their antibacterial and antioxidant qualities. The demand for novel antibacterial chemicals has accelerated due to the global increase in antibiotic-resistant diseases, and plant-based natural products have shown great promise. This study performs antibacterial activity of these plants that include; *Olea ferruginea*, Chamomile, *Glabra* by using Agar well- Diffusion method. Further, antioxidant activity of these plants; *Olea ferruginea*, Chamomile, *Glabra*, *Ficus carica*, *Conyza*, *Foeniculum vulgare*, *Juglans regia* and *Datura* by DPPH scavenging assay. Nanotechnology is rapidly advancing with significant applications across fields such as medicine, engineering, and agriculture. Metal-based nanoparticles, commonly synthesized using eco-friendly methods with plants or microorganisms, are notable for their natural detoxifying properties and safety. On the other hand, silver nitrate Nanoparticles offer versatile applications in agriculture and many fields.

Keywords: Antibacterial Potential of Natural Products, Antioxidant Activity, Oxidative Stress, Silver Nitrate Nanoparticles, Zin Oxide Nanoparticles.

INTRODUCTION

The local population has employed the evergreen plant *Olea ferruginea* to treat a variety of maladies, including fever, dental issues, bleeding gums, skin rashes, toothaches, and muscular issues. Besides Chamomile leaves, flowers, and stems are used to treat a variety of ailments, including analgesia, antiviral, anti-inflammatory, antiseptic, antidiabetic, antiproliferative, and antibacterial. *Glycyrrhiza glabra* is effective in treating ulcers, rheumatoid arthritis, and menopausal heat flashes, and have anti-inflammatory, gastroprotective, antitumoral, antiviral, antihepatotoxic, antifungal, antibacterial, antioxidant and anticancer properties. They also have the ability to lower low density lipoprotein (Roy *et al.*, 2023).

Medicinal plants like *Ficus carica*, *Conyza*, *Foeniculum vulgare*, and *Juglans regia* demonstrate robust antioxidant capacities due to high levels of phenolic compounds, terpenoids, and vitamins. *Ficus carica* and *Juglans regia*, for instance, are particularly rich in polyphenols and juglone, respectively, which are known for their potent radical-scavenging effects. *Foeniculum vulgare*, containing trans-anethole and limonene, and *Conyza*, with abundant flavonoids, further exemplify the strong antioxidant potential within diverse plant families. *Ficus carica* has demonstrated inhibitory effects against common bacterial pathogens. *Conyza*, rich in flavonoids and essential oils, offering potential as an alternative or adjunct to traditional antibiotics. *Foeniculum vulgare*, exhibits broad-spectrum antibacterial activity due to its essential oil content. *Juglans regia* polyphenolic compounds exhibit potent antibacterial effects, particularly against gram-positive bacteria. *Rose*, *Datura*, and *cinnamon* exhibit significant antibacterial and antioxidant activities, attributed to their bioactive compounds. *Rose* is rich in phenolics and flavonoids, offering potent antioxidant effects and effective antibacterial properties against various pathogens. *Datura* contains alkaloids with notable antimicrobial and antioxidant potential. *Cinnamon* possesses broad-spectrum antibacterial and strong antioxidant activity. The integration of these natural products into conventional therapies, or as stand-alone treatments, could provide safer, more sustainable alternatives to synthetic antibiotics (Prveen *et al.*, 2023).

Nanotechnology is rapidly advancing, with significant applications across fields such as medicine, engineering, and agriculture. Nanoparticles, measuring 1-100 nanometers, are fundamental to nanotechnology's rapid advancements, particularly in fields like biomedicine, where miniaturization of medical devices offers new possibilities (Rani *et al.*, 2022) (Chatterjee *et al.*, 2023). Zinc oxide nanoparticles (ZnO NPs), recognized by the FDA for their biocompatibility, are prominent due to their stability and diverse applications as they exhibit anti-inflammatory, antibacterial, anticancer, and anti-diabetic effects, underscoring their value in medicine and engineering. On the other hand, silver nanoparticles (AgNPs), notable for their unique properties, offer versatile applications across disciplines like water treatment, air purification, and pharmaceuticals as valuable tools for sustainable and innovative agricultural practices.

OBJECTIVE

To determine anti-bacterial and anti-oxidant potential of natural products. Also, synthesize eco-friendly zinc oxide and silver nanoparticles.

METHODOLOGY

This study is designed to explore antibacterial activity and antioxidant activity of different plant extract. Their antibacterial potential was determined by using agar well diffusion method of plants include; *Olea Ferruginea*, *Chamomile*, *Glabra*. The antioxidant activity was determined by DPPH scavenging assay of distinct plant extracts include; *Olea Ferruginea*, *Chamomile*, *Glabra*, *Conyza*, *Juglans Regia*, *Foeniculum Vulgare*, *Rose*, *Cinnamon*, *Ficus Carica*, *Datura*. The silver nanoparticles of *glabra* were formed. Also, iron oxide nanoparticles of *chamomile* obtained.

RESULT AND DISCUSSION

The results disclose that distinct plant extracts (*Glabra* and *Chamomile*) were strong antibacterial activity and potentially effective in suppressing microbial growth of pathogenic bacteria with variable potency. Also, these plants (*Chamomile*, *Glabra*, *Conyza*, *Juglans Regia*, *Foeniculum Vulgare*, *Rose*, *Cinnamon*, *Ficus Carica*, *Datura*) have strong antioxidant potential. Further, Silver nitrate and Zinc oxide nanoparticles were formed.

CONCLUSION

Research suggests that antibacterial substances produced from plants may lessen virulence factors in addition to preventing bacterial growth. The integration of these natural products into conventional therapies, or as stand-alone treatments, could provide safer, more sustainable alternatives to synthetic antibiotics. In future more research on the mechanisms, bioavailability, and clinical efficacy of these plant-derived antibacterial is essential to unlock their full therapeutic potential.

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