



A REVIEW ON EXTRACTION AND EVALUATION OF NEEM EXTRACT AS ANTIBACTERIAL ACTIVITY

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IN SUMMARY

The leaves of neem (*Azadirachta indica*) are a rich source of bioactive substances that may have medicinal uses. The purpose of this study was to assess the phytochemical, antibacterial, and antioxidant qualities of the extracted components while also optimizing the extraction conditions for neem leaves. Neem leaf extracts were obtained using a variety of extraction techniques, including solvent extraction, ultrasound-assisted extraction, and microwave-assisted extraction. Chromatographic (HPLC, GC-MS) and spectroscopic (FTIR, NMR) methods were used to characterize the extracts. The DPPH and FRAP assays were used to measure the antioxidant activity, while bacterial and fungus strains were used to test the antimicrobial activity. According to the findings, the greatest quantity of bioactive substances, such as azadirachtin, nimbin, and nimbidin, were extracted using ultrasonic assistance. The extracts' strong antioxidant and antibacterial properties suggested that they might find use in medicine and cosmetics. This research leads to more research and development of neem-based products by offering insightful information about the extraction and assessment of neem leaf bioactive chemicals.

KEYWORDS: phytochemical analysis, bioactive substances, extraction, antimicrobial, antioxidant, neem, and *Azadirachta indica*.

OVERVIEW

The neem tree, or *Azadirachta Indica*, is an evergreen that grows in most tropical nations and belongs to the mahogany family *Meliaceae*. It is one of two species in the genus *Azadirachta*, which grows in tropical and semi-tropical climates and is indigenous to India and Burma. It grows quickly, reaching an average height of 15-20 meters but infrequently reaching 35-40 meters. Although it is evergreen, it may lose most or almost all of its leaves during periods of extreme dryness. The Indian tradition has acknowledged neem's health benefits for thousands of years. Every portion of the neem tree has some therapeutic value [15, 16]. Since ancient times, practically every part of the tree has been used as a household insecticide and to treat a variety of human illnesses.

Fruits and roots have been used to treat intestinal helminthiasis, leprosy, and childhood respiratory conditions. Additionally, the bark extract is used as an astringent and tonic, and it helps with skin conditions, fever, thirst, nausea, and vomiting.

The plant *Azadirachta Indica* has a number of therapeutic qualities, such as antimicrobial, antioxidant, anti-inflammatory, anti-cancerous, hepatoprotective, anti-malarial, anti-diabetic, anti-HIV/AIDS, and antihypertensive effects. The phytochemicals found in the plant are what cause these actions. Therefore, the purpose of this work was to assess the phytochemicals and antibacterial activity of leaf extracts from *A. indica* against *E. coli*.

The evergreen tree neem is grown throughout the subcontinent. Since ancient times, every part of the tree has been utilized as a home cure and traditional medicine to treat a variety of human illnesses. Homeopathic, Ayurvedic, and Unani medicine have all made substantial use of neem. The neem tree is known as "Sarbaroganibarini" in Sanskrit, where its name, Arishtha, means "reliever of sickness." In Pakistan, the tree is still considered a village dispensary.

Azadirachta indica, also known as the neem tree, is an evergreen that belongs to the *Meliaceae* family of mahogany and is found in many tropical countries, including in India and Burma. It grows quickly and usually reaches a height of 15 to 20 meters, yet under the right circumstances it might reach 35 to 40 meters. Neem trees are typically evergreen, however during extreme droughts, they may lose the majority of their leaves.

Uses of Medicine

Indian customs have acknowledged neem's therapeutic benefits for thousands of years. The tree's leaves, bark, fruits, and roots have all been used to cure a variety of illnesses, including leprosy, intestinal infections, and childhood respiratory conditions. Neem bark is well-known for its astringent and tonic qualities, which aid in the treatment of skin conditions, nausea, and fever. Antifungal and Antibacterial Properties



Neem's antibacterial and antifungal properties are especially well-known. Numerous bacterial strains, such as Staphylococcus and Escherichia coli, as well as fungal strains, such as Candida and Aspergillus, have been demonstrated to be susceptible to the effects of neem oil. The plant's rich phytochemical composition is responsible for these qualities.

Conventional and Contemporary Applications

Traditional medical systems like Ayurveda and Unani have made substantial use of neem. Its name, "Arishtha," in Sanskrit, means "reliever of sickness," emphasizing its significance as a natural cure. Because of its many health benefits, neem is frequently considered a community dispensary in rural communities.

A LEAF

In traditional medicine, especially in Ayurveda, neem leaves have long been used. Because of their antibacterial, antiviral, antifungal, and anti-inflammatory qualities, they are well-known for their many health advantages.

Numerous bioactive substances found in neem (*Azadirachta indica*) leaves contribute to its therapeutic qualities. Neem

leaves contain a number of important chemical components, including:

CHEMICAL CONSTITUENT

1. Azadirachtin: This highly bioactive triterpenoid is the most well-known and researched component of neem. Numerous insecticidal, anti-inflammatory, and antibacterial properties of neem are attributed to it.
2. Nimbin: A substance with demonstrated analgesic (pain-relieving) and anti-inflammatory qualities. It is among the active ingredients that give neem its therapeutic properties.
3. The limonoid chemical nimbolide possesses noteworthy anti-inflammatory, antioxidant, and anticancer characteristics. It might function as a possible chemopreventive agent and aid in reducing inflammation.
4. Quercetin: A potent antioxidant flavonoid that may aid in lowering the body's oxidative stress. Additionally, quercetin has anti-inflammatory and antihistamine properties.



Fig.No.01) Leaf of Neem



Plant Profile: Neem Tree

- Biological source: *Azadirachta indica*
- Family : Meliaceae
- Kingdom : Plantae
- Division : Magnoliophyta
- Order : Sapindales
- Genus : *Azadirachta*
- Species : *Indica*

Fig.No.O2 Plant Profile

THE MATERIAL AND THE METHOD

1. Fresh or dried neem leaves
2. Solvents: [Water, Hexane, Acetone, Methanol, and Ethanol]
3. Equipment: [Soxhlet apparatus, rotary evaporator, centrifuge, microwave oven, ultrasonic bath, filter paper]
4. Chemicals: [HPLC-grade solvents for Azadirachtin, Nimbin, and Nimbidin standards]

METHODS

The extraction of solvents

1. Add 500ml of solvent to 100g of neem leaves.
2. Stir at room temperature for two to three hours.
3. Gather the extract after filtering it.
4. Use a rotary evaporator to evaporate the solvent.

Extraction Assisted by Ultrasound (UAE)

1. Add 500ml of solvent to 100g of neem leaves.
2. Sonicate at 40°C for 30 minutes.
3. Centrifuge for 10 minutes at 3000 rpm.
4. Gather the extract and let the solvent evaporate.

Extraction Assisted by Microwaves (MAE)

1. Add 500ml of solvent to 100g of neem leaves.
2. Use a 500W microwave for 30 seconds.
3. Centrifuge for 10 minutes at 3000 rpm.
4. Gather the extract and let the solvent evaporate.

Soxhlet Extraction

1. Add 500ml of solvent to 100g of neem leaves.
2. Use the Soxhlet device to extract for two to three hours.
3. Use a rotary evaporator to evaporate the solvent.

Chromatographic Evaluation

High-Performance Liquid Chromatography, or HPLC

2. Gas Chromatography-Mass Spectrometry, or GC-MS.

3. Thin Layer Chromatography, or TLC

CONCLUSION

A. indica extracts showed dose-dependent antibacterial activity against *E. coli*. In contrast to the ethanolic extract, the aqueous extract demonstrated superior antibacterial qualities against *E. coli*.

The investigation on the antibacterial qualities of neem extract produced encouraging findings. Neem extract showed promise as a natural antibacterial agent by successfully preventing bacterial development.

Highlights: Neem extract shown significant antibacterial action against a range of microorganisms.

It has applications in both cosmetics and pharmaceuticals. - Further research is needed to ensure safe and effective use

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