International Journal Of Public Mental Health And Neurosciences
ISSN: 2394-4668
(An Official publication of Sarvasumana Association)

Antibacterial activity of Neem and Tulsi

Vishal Lolge
Institute of biosciences and technology
MGM University
Chhatrapati Sambhajinagar, India
Lolgevishal32@gmail.com

Dilnawaz Ansari
Institute of biosciences and technology
MGM University
Chhatrapati Sambhajinagar, India
dils.farhat@gmail.com

Gayatri Aghadte
Institute of biosciences and technology
MGM University
Chhatrapati Sambhajinagar, India
Gayatri123aghadte@gmail.com

***Abstract*— In this research, the *Azadirachta indica* (Neem) plant is a medicinal plant from the *Meliaceae* family. Since ancient times, all components of the neem tree—leaves, blossoms, seeds, roots, and bark—have been utilized to cure fever, infections, inflammation, skin conditions, and dental issues. The major medicinal properties lie in neem's leaf. Neem leaf and its constituents are demonstrated to exhibit immunomodulatory, anti-inflammatory, antihyperglycaemic, antiulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic, and anticarcinogenic properties. Hence, they are said to be one of the medicinal plants. They are also used in cosmetic products to treat dandruff and skin conditions. In the research of discovering the presence of silver nanoparticles from medicinal plants, the neem leaf media changes from pale yellow to brown. *Ocimum sanctum* or *Ocimum tenuiflorum* (Tulsi) is a medicinal plant that belongs to the family of Lamiaceae which is also known as the "queen of plants". Extracts from the tulsi leaves of the plants are used in herbal teas as it is said to lower blood pressure, and cholesterol, leading to better sleep, supporting respiratory function, and helping to reduce anxiety. It treats different types of poisoning, common colds, headaches, malaria, heart disease, and inflammation. Oils extracted from the leaves have useful properties including analgesics, antipyretics, and stress reduction. The media turned brown from pale yellow on experimentation of green synthesis of silver nanoparticles from medicinal plants. The colour change from light yellow to brown indicated the presence of silver nanoparticles. It shows antibacterial activity against E. coli.**

Keywords: *Azadirachta indica, Meliaceae, Ocimum tenuiflorum, Ocimum sanctum, antihyperglycaemic, analgesics.*

I. Introduction

Azadirachta indica (Neem) belongs to the family of Meliaceae. All parts of the neem tree- leaves, flowers, seeds, fruits, roots and bark have been used traditionally for treating inflammation, infections, fever, skin diseases and dental disorders. The medicinal properties lie majorly in neem's leaf. Neem leaf and its constituents have been demonstrated to exhibit immunomodulatory, anti-inflammatory, antihyperglycemic, antiulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic and anticarcinogenic properties. The neem leaf media turns brown from pale yellow [4].

Ocimum sanctum or *Ocimum tenuiflorum* (Tulsi) belongs to the family of Lamiaceae and is known as the "queen of plants". Extracts from the leaves of the plants are used in herbal teas. Treatment of different types of poisoning, common colds, headaches, malaria, heart disease and inflammation. Oils extracted from the leaves have useful properties including analgesics, antipyretics and stress reduction. On experimentation of the synthesis of silver nanoparticles from medicinal plants, the media turned brown from pale yellow [1].

Nanoparticles or ultrafine particles are particles of matter with sizes in the range of 1-100 nm (nanometer in diameter). Because of their microscopic size, they have unique material characteristics such as colloidal properties and ultrafast optical effects or electrical properties. These physiochemical properties make nanomaterials more useful than their bulk forms in many fields such as agriculture, industry, medicine and engineering. Nanoparticles open up new possibilities in modern medicine with many advancements in research. Due

to their size, nanoparticles easily penetrate and reach the human cell which helps in drug delivery.

Organic nanoparticles synthesized from proteins, nucleic acids, lipids, carbohydrates and polymers are non-toxic and biocompatible. Inorganic nanoparticles such as silver (Ag), gold (Au), copper (Cu), zinc oxide (ZnO), etc. are also used in medicine, their stability and biocompatibility need to be improved by coating or encapsulating them with some organic materials. An example is Ferumoxytol which is a nanoparticle of Iron (Fe) metal that is used in the treatment of Anemia. The optical property of Au nanoparticles has been used in diagnostics. Organo-metallic nanoparticles are known for the controlled and targeted delivery of drugs for the treatment of many diseases including cancer. [2].

The use of nanoparticles takes us back to ancient times. Ayurveda is a traditional system of medicine practiced in the Indian subcontinent since the 7th century uses metal ash (*Bhasma*) to treat various diseases. *Bhasma* are metallic/ mineral preparations treated with herbal juices or decoctions and exposed to a certain amount of heat, as in the Puta system of Ayurveda. *Bhasma* is widely recommended in India for the treatment of various disease conditions.

Bhasma preparation is down as a top-down approach often begins with the burning of metals, ores, minerals, etc. at very high temperatures and repeated titration with plant extract or other organic materials for purification. Wet grinding of purified metal ash with plant extracts or powders in *Bhasma* preparation could create microscopic thermal cavities that allow secondary plant metabolites to be activated and act as chelating agents. Since *Bhasma* processing requires repeated cycles of high temperatures, eg, 600°C in the final stages of preparation, secondary metabolites bound to the metal ash could be lost due to maceration. However, in Ayurvedic treatment practice, *Bhasma* is administered either alone or in combination with medicinal plant extracts or powders as required [7].

II. Methodology

For Neem Leaf [*Azardirachta indica*]
Extraction and Purification

- Take neem leaves and clean.
- Add 15 gm of finely cut leaves in a 250 ml Erlenmeyer flask containing 50ml distilled water.
- Place it in a water bath for 25 minutes at 60°C.
- Allow the extract to cool at room temperature or 25°C.
- Percolate the neem leaves using Whatman Filter Paper to obtain the neem extra and place it in a beaker.
- 100 ml of 1mM solution of AgNO3 is taken in a conical flask.
- Add 10 ml of aq. neem extract to 50 ml of 1mM aq. AgNO3 solution.
- Stir gently using a vortex mixture for 20 minutes and store it in an amber-coloured bottle.
- Incubate in a dark chamber for a few hours.
- A change in colour from light yellow to dark brown indicates a reduction of Ag+ ions to silver nanoparticles (AgNP).
- Take sterile eppendorf at 121°C for at least 20 minutes.
- Fill the solution in the Eppendorf up to 2 ml.
- Centrifuge the sample in Eppendorf at 2000 rpm for 15 minutes.

Tulsi
For Tulsi Leaf [*Ocimum sanctum*]
Extraction and Purification

- Wash & dry 10g tulsi leaves.
- Crush the tulsi leaves using a mortar pestle and add 100 ml of distilled water.
- Boil at 80°C for 10 min and let the extract cool down.
- Use a muslin cloth to let the extract seep into a beaker.
- Centrifuge the extract for 20-25 min at 10,000 rpm
- Collect the supernatant & store it at 4°C. (refrigerate it)
- This filtrate was a reducing agent used as a Stabilizing & reducing agent.
- Conc. of 1 mM Silver Nitrate was prepared by dissolving 0.169g of AgNO3 in 1 L of deionized water.
- Store it in an amber-colored bottle to prevent photo-oxidization.
- In 10 ml of tulsi leaf extract add 90 ml of AgN03 and heat the mixture at 30 °C for 15 min.
- Change in colour from light yellow to brown indicates the form of AgNO3
- Centrifuge the solution at 10,000 rpm for 20 mins.

Anti-bacterial activity

- Pure culture of E. coli was taken from the laboratory
- Culture was streaked onto the nutrient medium Disk was kept inside.
- Plates were incubated for 24 hrs.

III. Results

a) Extract was successfully extracted by a simple method, and then the extract was filtered via a syringe filter, we collected 10 ml of extract.
b) A clear zone of antibacterial activity was observed after incubation of 24 hrs.
c) Neem and Tulsi both show antibacterial activity against E. coli and the colour change from pale yellow to brown shows the presence of silver nanoparticles in neem and tulsi.

A. Figures and Tables

Fig.1. Neem Extract.

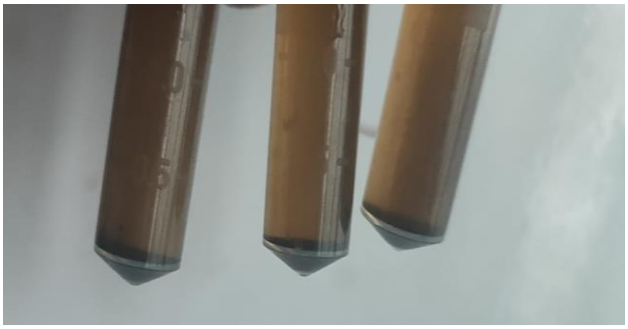

Fig.2. Centrifuged Neem Extract.

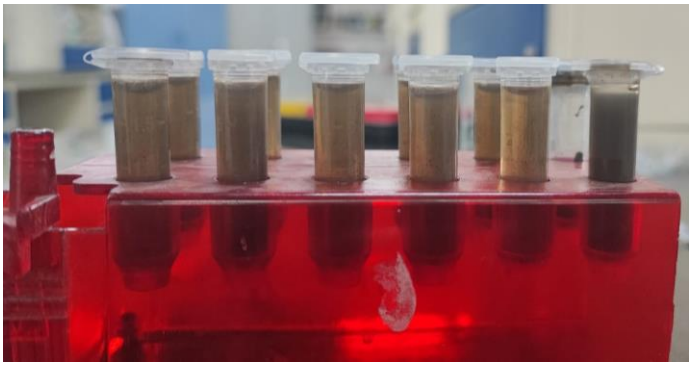

Fig.3. Centrifuged Tulsi Extract.

Fig.4. E. Coli inoculum.

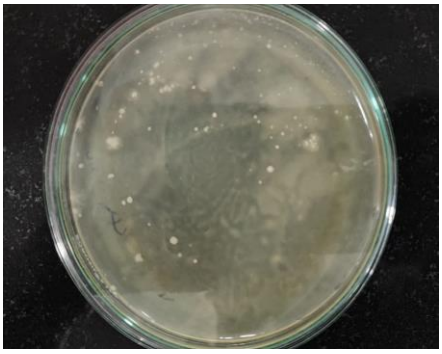

Fig.5 E. coli on nutrient agar.

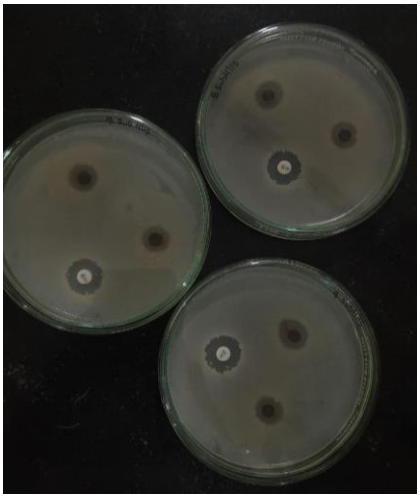

Fig.6. Clear zone on E. coli against neem and tulsi

TABLE I. COMPOSITION OF NUTRIENT AGAR

Peptone	0.5gm
NaCl	0.5gm
Yeast extract	0.3gm
Agar-Agar	1.8gm
Distilled water	100ml

TABLE II. ZONE OF CLEARANCE

Table Head	**Antibacterial Activity**		
Sr.No.	***Name of plant***	***Zone***	***Zone size in diameter***
1	Neem	Yes	2cm
2	Tulsi	Yes	1.5cm

REFERENCES

[1] Asgarpanah J, Khoshkam R. Phytochemistry and pharmacological properties of Ruta graveolens L. J Med Plants Res 2012;6(23):3942-9.

[2] Chambers HF, Deleo FR. Waves of resistance: Staphylococcus aureus in the antibiotic era. Nat Rev Microbial 2009;7(9):629-41.

[3] Gautam CK, Srivastav AK, Bind S, Madhav M, Shanthi V. An insight into biofilm ecology and its applied aspects. Int J Pharm Pharm Sci 2013;5(4):69-73.

[4] Jain P, Sharma HP, Basri F, Baraik B, Kumari S, Pathak C. Pharmacological profiles of ethno-medicinal plant: Plumbago zeylanica Linn. A review. Int J Pharm Sci Rev Res 2014;24(1):157-63.

[5] Kang S, Min H. Ginseng, the 'Immunity Boost': The effects of Panax ginseng on the immune system. J Ginseng Res 2012;36(4):354-68

[6] Kostakioti M, Hadjifrangiskou M, Hultgren SJ. Bacterial biofilms: Development, dispersal, and therapeutic strategies in the dawn of the postantibiotic era. Cold Spring Harb Perspect Med 2013;3(4): a010306.

[7] Namasivayam SK, Preethi M, Bharani RS, Robin G, Latha B. Biofilm inhibitory effect of silver nanoparticles coated catheter against Staphylococcus aureus and evaluation of its synergistic effects with antibiotics. Int J Biol Pharm Res 2012;3(2):259-65.

[8] Namasivayam SK, Roy EA. Anti-biofilm effect of medicinal plant extracts against clinical isolate of biofilm of Escherichia coli. Int J Pharm Sci 2013;5(2):486-9-16

[9] Salunke GR, Ghosh S, Santosh Kumar RJ, Khade S, Vashisth P, Kale T, et al. Rapid efficient synthesis and characterization of silver, gold, and bimetallic nanoparticles from the medicinal plant Plumbago zeylanica and their application in biofilm control. Int J Nanomedicine 2014;9: 2635-53.