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Antibacterial Activities of Lantanacamaralinn

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Abstract: *Herbal drugs are the potential sources of therapeutic aid for the treatment and prevention of number of ailments as recognized very early by Ayurveda, Unani, and traditional folk - medical practitioners. The rich biodiversity of plants makes them a treasure house for obtaining new and novel compounds either themselves as drugs or lead molecules for drugs with different mechanisms of action. Lantana camara L. belonging to the family Verbenaceae and universally known as wild or red sage is the most widespread species of the genus. It occurs in most parts of the world as an evergreen notorious weed species. It is also considered as an ornamental garden plant. It is widely used in different traditional medical practices for treating various health problems. Different parts of the plant are used in treating various human ailments. The plant extracts and essential oil of L. camara possess various bioactivities including antimicrobial activities. The therapeutic potential of the plant is due to the occurrence of many bioactive phytocompounds. In last decade, scientists and researchers around the globe have elaborately studied the chemical composition of the whole plant of L. camara as well as its biological activities. This article reviews the antimicrobial activities of L. camara.*

Keywords: Antimicrobial activities, Essential oils, Nanoparticles, *Lantana camara*, Solvent extract

I. INTRODUCTION

Resistance to antibacterial agents is a major global health problem, and the number of emerging multi-drug resistant microbial strains is continuously increasing. This situation has prompted researchers to develop efficient new antimicrobial agents, and thus the exploration of natural products to discover new drug molecules is continuously going on [1,2]. Medicinal plants could be a good alternative source for antibiotics in use (against which microbes have developed resistance), as most of the medicinal plants are safe with little or no side effects, cost-effective and have the ability to affect a wide range of antibiotic resistant microorganisms [3]. Medicinal plants contain several different phytochemicals or secondary metabolites that may act individually, additively or in synergy to improve human health [4]. Down the ages, essential oils (EOs) and other extracts of plants have evoked interest as sources of natural antimicrobial agents [5]. According to the WHO medicinal plants would be the best source to obtain a variety of drugs [6]. *Lantana camara* is one of the plants known for having many medicinal uses in traditional system of medicine, used in many parts of the world to treat a wide variety of disorders [7]. *L. camara* whole plant and plant parts, *viz.,* leaves, flowers, roots, fruits, and EOs have been thoroughly studied for their chemical compositions and bioactivities. The present review aims to document the antimicrobial properties ofL. camara.

The genus *Lantana* (Verbenaceae) as described by Linnaeus in 1753 contained seven species, six from South America and one from Ethiopia. *Lantana* from the Latin *lento*, to bend, probably derives from the ancient Latin name of the genus *Viburnum*. *Lantana* is mostly native to subtropical and tropical America, but a few taxa are indigenous to tropical Asia and Africa. It is a genus of about 150 species. *L. camara* Linn., commonly known as wild or red sage, is the most widespread species of this genus [8]. It is planted as an ornamental plant and is now a highly invasive weed in many parts of the world. *L. camara* is found at altitudes from sea level upto 2000 m and can thrive very well under rainfall ranging from 750 to 5000 mm per annum and it grows up to 3 mheight. It is a woody straggling evergreen, aromatic wild shrub (Fig. 1). The stems and branches are sometimes thorny. The leaves are arranged in opposite pairs and are broadly oval, bright green, rough with short hairs, with finely toothed edges along with a number of veins giving a wrinkled appearance. Flower heads contain 20-40 flowers, usually

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2.5 cm across; the color of flowers varies from white, cream or yellow to orange pink, purple and red with small rounded heads, often in two colors. The fruits are fleshy berries in clusters, shiny and globose in shape, green in color which on ripening turns to black. The root system is very strong with a main taproot and a mat of many shallow side roots. *L. camara* is known by different names in different languages in India, *viz.,* Raimuniya (Hindi), Chaturangi and Vanacehdi (Sanskrit) and Kakke, Natahu and Unnigida (Kannada), etc

Chemical constituents

L. camara is a rich source of bioactive compounds, *viz.,* flavones, isoflavones, flavonoids, anthocyanins, coumarins, lignans, catechins, isocatechins, alkaloids, tannin, saponins, and triterpenoids. The various bioactive molecules isolated from different parts of the plant and its EOs were reported, and these details of *L. camara* phytochemistry have been compiled by a few authors.

Medicinal uses

In India, herbal medicines have been the basis of treatment and cure for various diseases in traditional methods practiced such as Ayurveda, Unani, and Siddha . *L. camara* has been used as an herbal medicine since long back. All parts of this plant have been traditionally used for several ailments worldwide. The plant extracts have been used in folk medicine for the treatment of cold, headache, uterine hemorrhage, chicken pox, conjunctivitis, eye injuries, whooping cough, asthma, bronchitis, tumors, chicken pox, measles, ulcers, swellings, skin rashes, eczema, eruptions, high blood pressure, bilious fevers, catarrhal infections, tetanus, rheumatism, malaria, jaundice, fistula, and pustules. Further, used for the treatment of skin itches, leprosy, scabies, used as an expectorant and as an antiseptic for wounds. *L. camara* is considered to be antiseptic, antispasmodic, anti-inflammatory, antihypertensive, antipyretic, analgesic, hypolipidemic, carminative, and diaphoreticagent. The extracts are reported to have antimicrobial, mosquito repellent, termiticidal, insecticidal, and larvicidal activities

Antibacterial activity

Different solvent extracts, EOs, and nanoparticles of *L.* camarahave significant antibacterial activity . Crude extract of *L. camara* root was found to be active against Staphylococcusaureusand *Bacillus* cereus. Petroleum ether, benzene, chloroform, and methanol fractions of L. camaraleaves were tested against Escherichiacoli, Salmonellatyphi, *S.* aureus, and Pseudomonasaeruginosa. Chloroform and methanol extracts showed activity against all the bacteria tested, while petroleum etherfraction only against *P.* aeruginosaandbenzenefraction only againstS. typhi. Antibacterial activity of extracts of L. camararoot-bark was evaluated. Chloroform and methanolic extracts of *L. camara* were found to be more specific toward the Gram-positive strains, although Gram- negative *P. aeruginosa* was also inhibited by the methanol extract, while the aqueous extract was found to be inactive. Dichloromethane and methanol (1:1, v/v) extract of *L.* camaraexhibited significant antibacterial activity against *E. coli* (ATCC 10536) and *P.* aeruginosa at both 1000 and 500 µg/ml concentrations . Begum *et al.* reported antimycobacterial activity of flavonoid, viz*.,* loneroid and lantanoside and their acetyl derivative extracted from *L. camara* against Mycobacteriumtuberculosis. These compounds exhibited 30%, 37% and 98% inhibition of the bacteria, respectively.

Phytochemical Composition

Lantana camara contains bioactive compounds such as:

- Flavonoids
- Triterpenoids (e.g., lantadene A and B)
- Saponins
- Alkaloids
- Essential oils

These compounds are believed to contribute to its antibacterial effects .

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Mechanism of Action

The antibacterial activity may be due to:

- Disruption of bacterial cell membranes
- Inhibition of protein synthesis
- Interference with microbial metabolic processes

Methods of Evaluation

- Agar well diffusion
- Disc diffusion
- MIC (Minimum Inhibitory Concentration
- MBC (Minimum Bactericidal Concentration)

These are used to assess the potency of Lantana camara extracts against bacterial strains.

II. CONCLUSION

Lantana camara Linn. demonstrates significant antibacterial activity against a range of pathogenic bacteria, making it a promising candidate for the development of natural antimicrobial agents. The presence of bioactive compounds such as flavonoids, alkaloids, and essential oils contributes to its effectiveness. Among various extracts, methanolic and ethanolic preparations often show the highest antibacterial potential. With further research and clinical validation, Lantana camara could play an important role in alternative medicine and pharmaceutical applications, especially in the fight against antibiotic-resistant bacterial strains.

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