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# "Comprehensive Review on Lantana camara: Phytochemistry, Pharmacology and Therapeutic Potential"

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**ABSTRACT:**

*Lantana camara* L. (family Verbenaceae) is a hardy perennial shrub commonly found across tropical and subtropical climates. Traditionally, various parts of the plant have been incorporated into folk remedies for treating respiratory issues, dermatological problems, wounds, and digestive disorders. The plant contains a diverse range of bioactive compounds such as flavonoids, terpenoids, alkaloids, phenolics, steroids, and volatile oils. Numerous pharmacological studies have confirmed its antimicrobial, antioxidant, anti-inflammatory, hepatoprotective, larvicidal, and anticancer potential. Despite its medicinal value, the plant is also associated with toxicity in both humans and animals due to lantadenes. This review summarizes its botanical features, ethnomedicinal applications, phytochemical profile, pharmacological activities, and safety challenges to serve as a foundation for future scientific and therapeutic advancements.

**Keywords**: *Lantana camara*, phytochemical profile, therapeutic effects, herbal applications, lantadenes, traditional medicine.

## Introduction:

Herbal remedies form the basis of many traditional healthcare systems throughout the world. Among these medicinal plants, *Lantana camara*—commonly referred to as wild sage or red sage—has gained notable attention. Although valued for its biological properties and therapeutic potential, the plant is also recognized as an aggressive invasive weed with significant toxicity concerns. Numerous scientific investigations have focused on its bioactive molecules and pharmacological actions, yet its toxic nature continues to limit widespread therapeutic use.

## Pharmacological Actions:

Studies demonstrate that extracts of *L. camara* exhibit several noteworthy biological activities:

1. **Antimicrobial:** Exhibits pronounced antibacterial, antifungal, and antiviral effects.
2. **Anti-inflammatory:** Reduces inflammation and associated pain in experimental models.
3. **Antioxidant:** Rich in compounds capable of combating oxidative stress and protecting cellular components.
4. **Cytotoxic properties:** Certain extracts exhibit inhibitory action against multiple cancer cell lines.

**5.Antidiabetic:** Shows potential in lowering blood glucose levels and enhancing insulin function.

## Materials and Methods:

Research involving *Lantana camara* requires careful selection of plant materials and extraction techniques.

***Materials:***

- **Plant parts:** Leaves and stems are most frequently collected for analysis.
- **Solvents:** Methanol, petroleum ether, and acetone are typically used during extraction.
- **Apparatus:** Equipment such as Soxhlet extractors, supercritical fluid extractors, and microwave-assisted units facilitate efficient extraction.

***Methods:***

- **Supercritical Fluid Extraction:** Utilizes supercritical $CO_2$ for enhanced recovery of phytochemicals.
- **Microwave-Assisted Extraction:** Shortens extraction time while improving yield.
- **Countercurrent Extraction:** Enables large-scale extraction.
- **Column Chromatography:** Separates and purifies bioactive molecules.
- **Short-Path Distillation:** Produces highly refined compounds.

## Botanical Profile:

- **Scientific Name:** *Lantana camara* L.
- **Family:** Verbenaceae
- **Common Names:** Wild sage, Spanish flag, Surinam tea plant, Raimuniya (India)
- **Distribution:** Originally from tropical America but now widely naturalized across Africa, India, Asia, and Australia.

**Fig No. 1:Camara Lanatana flower**

**Morphological Characteristics:**

- *Lantana camara* is an evergreen shrub typically reaching 2–4 m in height, forming dense thickets or vine-like growth.
- The stems are square-shaped with small curved prickles.
- Leaves are arranged oppositely, dark green, approximately 6 cm long, and have serrated margins.
- Flowers exist in multiple colors including yellow, pink, orange, red, and lilac, pollinated mainly by insects.
- The berries transition from green to dark purple-black as they mature.

***Types of Lantana Species:***

Several *Lantana* species are cultivated for ornamental and ecological purposes, although many can become invasive.

**1. Common Lantana (*L. camara*)**

The most widely cultivated species of lantana is the common lantana, often referred to as shrub verbena. In cooler regions, it can be maintained as an annual plant or grown in pots. Although it adds vibrant color and aesthetic appeal to gardens and indoor spaces, it must be handled carefully in tropical areas. This is because the plant grows aggressively and has become invasive in places such as Texas, Florida, Hawaii, and parts of Australia. **Natural distribution:** Native to Central and South America.

**Fig No.2. Common Lantana**

**2. Trailing Lantana (*L. montevidensis*)**

Trailing lantana forms a broad, spreading mat with thick foliage and attractive blossoms, making it highly suitable for use as a ground-covering plant. It grows vigorously, and although it is not as invasive as *L. camara*, it has still managed to escape cultivation in several parts of the southern United States. The plant should be handled with care because its fine hairs can cause skin irritation.

**Native range:** Tropical regions of South America; its scientific name refers to its initial identification in Montevideo, Uruguay.

**Fig No.3.Trailing Lantana**

**3. Buttonsage (*L. involucrata*)**

A lantana species that is native to the US., buttonsage is a sweet little shrub. When the leaves are crushed, they have a fragrance similar to sage, giving this
lantana plant its common name.

**Fig no 4: Button sage**

Native Range: South Florida to Central and South America.

**4. Popcorn Lantana (Lantana Trifolia):**

Also called lavender popcorn, this lantana plant is as much cultivated for its decorative fruit as for its flowers. Giving the plant its common name, the fruits form in bundles that look like individual pieces of purple popcorn! Don’t be tempted to eat them, however, many

lantana species are poisonous.

**Fig No.5.Popcorn Lantana**

Local Range: West Indies, Mexico, Central, and South America.

**Traditional and Ethnomedicinal Uses:**

*Lantana camara* has long been incorporated into folk medicine across various cultures.

- Leaf decoctions treat fevers, cough, asthma, and common colds.
- Leaf paste is applied to cuts, ulcers, and skin eruptions.
- Fruits have been used for toothaches and as mild antiseptics.
- Roots are used traditionally against malaria, rheumatism, and snake bites.
- Flower infusions serve as antispasmodic and sweat-inducing remedies.

Traditional practices in Central and South America report its application in treating skin infections like measles and chickenpox. Extracts containing oleanolic acid and other triterpenes have shown potential hepatoprotective, antispasmodic, and anti-inflammatory properties.

**Phytochemistry:**

The plant's therapeutic potential is linked to its diverse phytochemical profile.

- **Triterpenoids:** Lantadene A & B, oleanolic acid, ursolic acid
- **Flavonoids:** Quercetin, luteolin, kaempferol
- **Steroids & Alkaloids:** β-sitosterol, lantamine, camarin
- **Phenolics:** Chlorogenic and caffeic acids
- **Volatile oils:** Caryophyllene, α-pinene, humulene, limonene

**Pharmacological Activities:**

- **Antimicrobial:** Effective against pathogens like *E. coli*, *Staphylococcus aureus*, and *Candida albicans*.
- **Anti-inflammatory/Analgesic:** Reduces swelling and pain in animal models.
- **Antioxidant:** Methanolic extracts show noteworthy free-radical scavenging activity.
- **Anticancer:** Certain triterpenoids demonstrate cytotoxic effects on tumor cells.
- **Hepatoprotective:** Provides protection against chemically induced liver injury.
- **Larvicidal:** Shows strong activity against mosquito vectors such as *Aedes aegypti*.

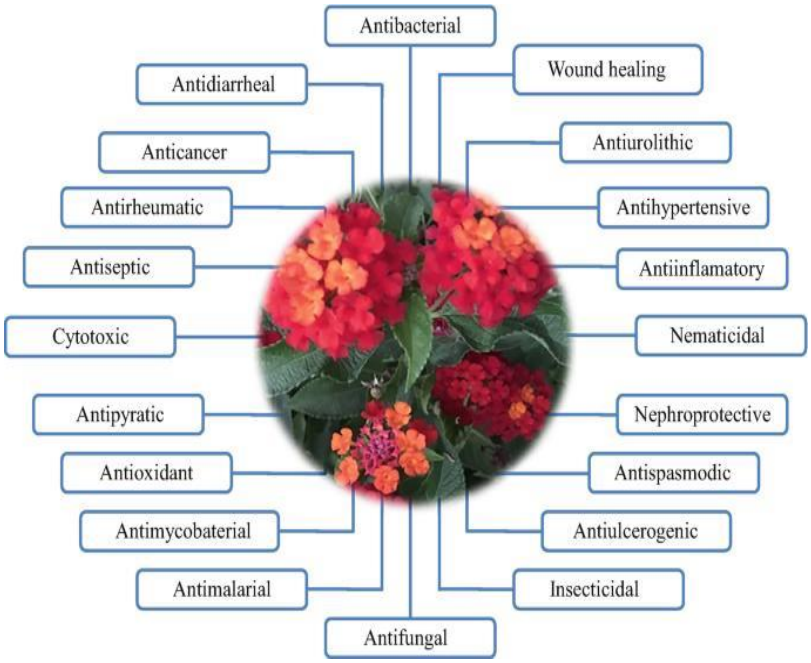


**Fig No.6.Pharmacological Activities of Camara Lantana**

***Toxicity Profile:***

The toxicological risk of *Lantana camara* primarily arises from its triterpenoid lantadenes.

- **Animals:** Can cause liver damage, photosensitivity, loss of appetite, and death in grazing livestock.
- **Humans:** Unripe fruits are potentially toxic, producing nausea, vomiting, stomach ache, and liver complications.
- **Precaution:** Standardization of dose and detailed toxicity testing are essential before clinical utilisation.

## Conclusion:

*Lantana camara* presents a dual nature—offering a rich reservoir of medicinally useful phytochemicals while simultaneously posing considerable toxicity risks. Its diverse biological activities highlight its potential as a promising source for new therapeutic agents. Nonetheless, its toxic components remain a significant barrier to medicinal acceptance. Future research should prioritize toxicity mitigation, dosage standardization, and development of safe pharmaceutical formulations to enable the plant's incorporation into modern herbal therapies.

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