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REVIEW ARTICLE

A Review on Medicinal Properties of *Lantana camara* Linn.

Sanjeeb Kalita, Gaurav Kumar, Loganathan Karthik, Kokati Venkata Bhaskara Rao*
Molecular and Microbiology Research Laboratory, Environmental Biotechnology Division,
School of Bio Sciences and Technology, VIT University, Vellore, Tamil Nadu - 632 014, India.
*Corresponding Author E-mail: **kokatibhaskar@yahoo.co.in**

ABSTRACT:
The knowledge of traditional medicine and medicinal plants and their study of scientific chemical principles may lead to the discovery of newer and cheaper drugs. *Lantana camara* is well known to cure several diseases and used in various folk medicinal preparations. In last few decades, scientist and researchers around the globe have elaborately studied the chemical composition of whole plant of *L. camara* as well as biological pharmacological activities. These studies established the therapeutic potential of *Lantana camara* in modern medicines and a possible candidate for the drug discovery. The present review gives a bird's eye view on ethnobotany, phytochemistry, pharmacology and toxicology of *L. camara*.

KEYWORDS Medicinal plants, *Lantana camara* Linn., ethnobotany, phytochemistry, pharmacology.

INTRODUCTION:
Medicinal plants represent an important source of medically important compounds. Since ancient time, medicinal plants are used to cure several types of health problems. Systemic analysis of these plants provides a variety of bioactive molecules for the development of newer pharmaceutical products. Recently, there is a growing interest in the pharmacological evaluation of various plants used in different traditional system of medicine. In last few decades, many of traditionally known plants have been extensively studied by advanced scientific techniques and reported for various medicinal properties viz, anticancer activity, anti-inflammatory activity, antidiabetic activity, anthelmintic, antibacterial activity, antifungal activity, hepatoprotective activity, antioxidant activity, larvicidal activity etc. [1-10]

Lantana camara Linn. is a flowering ornamental plant belonging to family Verbenaceae. *L. camara* is also known as Lantana, Wild Sage, Surinam Tea Plant, Spanish flag and West Indian lantana. *L. camara* is a well known medicinal plant in traditional medicinal system and recent scientific studies have emphasized the possible use of *L. camara* in modern medicine.

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The present review aims to document the morphology, distribution, phytochemistry and medicinal properties of *L. camara* and its future prospects for the further scientific investigation for the development of effective therapeutic compounds.

Taxonomy :
Kingdom: Planate; Division: Magnoliophyta; Class: Magnoliopsida; Order: Lamiales; Family: Verbenaceae; Genus: Lantana; Species: *Lantana camara* Linn.

Plant description:
Morphology of *L. camara* is reported in Figure 1. *L. camara* is a low erect or subscandent vigorous shrub with tetrangular stem, stout recurved pickles and a strong odour of black currents. Plant grows up to 1 to 3 meters and it can spread to 2.5 meter in width. Leaves are ovate or ovate oblong, acute or sub acute, crenate serrate, rugose above, scabrid on both sides. The leaves are 3-8 cm long by 3-6 cm wide and green in colour. Leaves and stem are covered with rough hairs. Small flower held in clusters (called umbels). Colour usually orange, sometime varying from white to red in various shades and the flower usually change colours as they ages. Flowers are having a yellow throat, in axillary head almost throughout the year. The calyx is small, corolla tube slender, the limb spreading 6 to 7 mm wide and divided in to unequal lobes. Stemen four in two pairs, included and ovary two celled, two ovuled. Inflorescences are produced in pairs in the axils of opposite leaves. Inflorescences are compact, dome shaped 2-3 cm across and contain 20-40 sessile flowers. Root system is very strong

and it gives out new fresh shoots even after repeated cuttings. [11]

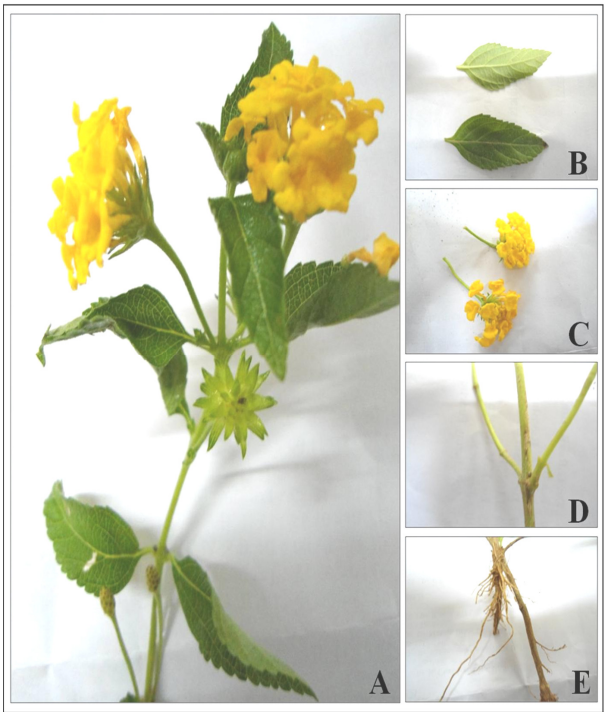

Figure 1: Morphology of *Lantana camara* Linn. (golden variety), A) Plant, B) Dorsal and ventral surface of leaves, C) Flowers, D) Stem, E) Root

Geographical distribution:

L. camara is a tropical origin plant and native to Central and Northern South America and Caribbean. *L. camara* is now spreaded to nearly 60 countries viz, New Zealand, Mexico, Florida, Trinidad, Jamaica and Brazil. It is reported in many African countries including Kenya, Uganda, Tanzania and South Africa.

In India, *L. camara* was probably introduced before 19th century. Currently *L. camara* is distributed throughout India. *L. camara* is known by different name in various different languages in India viz, Raimuniya (Hindi), Chaturangi and Vanacehdi (Sanskrit), Arippu and Unnichedi (Tamil), Aripoov, Poochedi, Konginipoo and Nattachedi (Malayalam), Thirei, Samballei and Nongballei (Manipuri), Tantani and Ghaneri (Marathi), Pulikampa (Telegu), Kakke and Natahu (Kanada).

Ethnopharmacology:

L. camara is an important medicinal plant with several medicinal uses in traditional medication system. It is been used to cure many health problems in different parts of the World. Leaves are used to treat cuts, rheumatisms, ulcers, catarrhal infection, tetanus, rheumatism, malaria, cancer, chicken pox, asthma, ulcer, swelling, eczema, tumour, high blood pressure, bilious fever, ataxy of abdominal viscera, sores, measles, fevers, cold and high blood pressure. In Ghana, infusion of the whole plant is used to cure bronchitis and the powdered root in milk was given to children for stomach-ache and as a vermifuge. Lantana oil is used in the treatment of skin, itches, as an anticeptic for wounds. In leprosy and scabies decoctions were applied externally. [12-14]

Phytochemical composition:

Phytochemical composition of the *L. camara* has been extensively studied in last few decades. Different parts of *L. camara* are reported to possess essential oils, phenolic compounds, flavonoids, carbohydrates, proteins, alkaloids, glycosides, iridoid glycosides, phenyl ethanoid, oligosaccharides, quinine, saponins, steroids, triterpens, sesquiterpenoides and tannin as major phytochemical groups. [15-18]

Pharmacological studies:

L. camara is an important medicinal plant of the family Verbenaceae. In recent history this plant is reported for various medicinal properties (Figure 2).

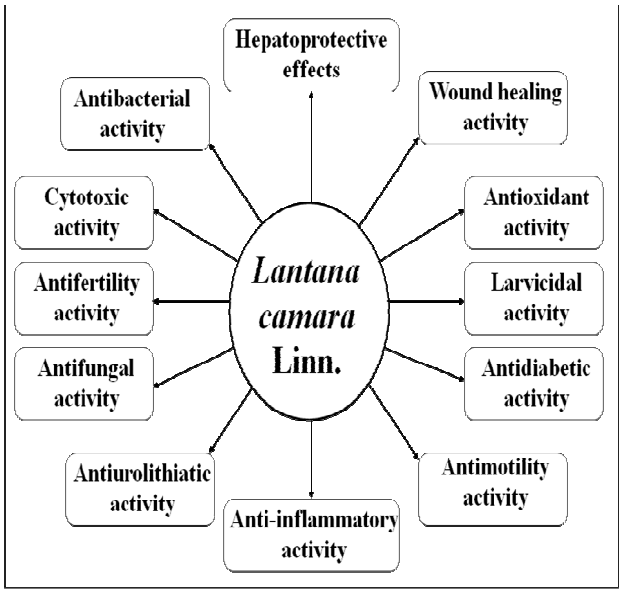

Figure 2: Medicinal properties of *Lantana camara* Linn.

Antibacterial activity:

Different varieties of *L. camara* plants' leaves and flowers were reported for antibacterial activity. Three different solvent extract of leaves and flowers of four different varities of *L. camara* exhibited significant antibacterial activity *E. coli*, *Bacillus subtilis* and *P. aeruginosa* whereas poor antibacterial activity against *Staphylococcus aureus*. [19]

Ethanolic extracts of *L. camara* leaves and roots were reported for antibacterial activity. The *in vitro* antibacterial activity was performed by microdilution method. The extracts exhibited antimicrobial activity against *Staphylococcus aureus, Proteus vulgaris, Pseudomonas aeruginosa*, *Víbrio cholareae*, *Escherichia coli* and two multiresistant strains *E. coli* and *S. aureus.* [20]

Methanolic extracts of different parts of *L. camara* were screened for antimicrobial activity against 10 bacteria and 5 fungi by disk diffusion method and broth microdilution method. The leaves extract of *L. camara* showed highest activity against Gram positive *Bacillus cereus* and Gram negative *Salmonella typhi*. [21]

Antifungal activity:
Antifungal potential of *L. camara* was screened against *Alternaria* sp. which causes different plant diseases especially in vegetable plants. The antifungal activity was performed by food poison plate method at three different concentrations of extract viz, 10 mg/ml, 15 mg/ml and 20 mg/ml. At 20mg/ml dose *L. camara* exhibited significant antifungal activity against *Alternaria* sp. **[22]**

Antifungal activity of ethanol and hot water extract of *L. camara* was screened against wood destroying white and brown rot fungi. Both extracts exhibited efficient antifungal activity against white and brown rot fungi, however ethanol extract was highly potential at very low concentration (0.01%). [23]

Antiulcerogenic activity:
Antiulcerogenic activity of the methanol extract of leaves of *L. camara* was reported on asprin, ethanol and cold resistant stress induced gastric lesions in rats. Pre-treatment of the effected rats with the extract (200 and 400 mg/kg body weight) showed significant protective effect in aspirin induced, ethanol induced and cold restraint stress induced ulcers in rats. The extract resulted in dose dependent antiulcerogenic activity in all models. [24]

Hemolytic activity:
The hemolytic activity of *L. camara* aqueous extract and its solvent fractions was performed by modified spectroscopic method at four different concentrations (125, 250, 500, 1000 µg/ml). The aqueous extract and its solvent fractions exhibited very low hemolytic activity towards the human erythrocytes. The hemolytic activity of the different extracts was found in the following order: chloroform fraction > hexane and ethyl acetate fraction (50:50) > aqueous extract > ethanol fraction >methanol fraction. [17]

Antihyperglycemic activity:
Antihyperglycemic activity of methanol extract of leaves *L. camara* was reported in alloxan induced diabetic rats. Oral administration of the methanol extract of *L. camara* (400 mg/kg body weight) leaves resulted in decrease in blood glucose level to 121.94 mg/dl in alloxan induced diabetic rats. [25]

Hypoglycemic activity of methanol extract of *L. camara* Linn fruits was screened in streptozotocin induced diabetic rats (Wistar albino rats). Extract treatment at doses of 100 and 200 mg/kg body weight resulted in dose dependent decrease in serum glucose level in streptozotocin induced diabetic rats. Extract treatment also showed improvement in body weight, HbA1c profile as well as regeneration of liver cells. [26]

Wound healing activity:
Wound healing property of aqueous extract of leaf of *L. camara* was reported in rats. Topical application of the extract on the wound (100 mg/kg/day) significantly enhanced the rate of wound contraction (98%), synthesis of collagen and decreased wound healing time. [27]

Ethanol extract of leaf of *L. camara* was reported for wound healing activity in adult male Wister rats. Topical application of the extract over the wound significantly increased the wound healing activity. Histological analyses of healed wounds confirmed the role of extract in healing. [28]

Antimotility activity:
Methanol extract of *L. camara* leaves was reported to possess antimotility activity in mice. Intestinal motility was assayed by charcoal meal test in mice. At a dose of 1 g/kg body weight, the extract completely inhibited the transit of charcoal in normal mice. Intraperitoneal administration of 125 and 250 mg/kg body weight the extracts significantly reduced the fecal output in castor oil induced diarrhoea in mice. [29]

Mosquito controlling activity:
Essential oil from the leaves of *L. camara* was reported to possess adulticidal activity against *Aedes aegypti*, *Culex quinquefasciatus*, *Anopheles culicifacies*, *An. fluvialitis* and *An. stephensi* mosquitoes with LD_{50} values 0.06, 0.05, 0.05, 0.05 and 0.06 mg/cm(2) while LD_{90} values were 0.10, 0.10, 0.09, 0.09 and 0.10 mg/cm(2) against *Ae. aegypti, Cx. quinquefasciatus, An. culicifacies, An. fluvialitis and An. stephensi* respectively. [30]

Mosquito larvicidal activity of methanol and ethanol extracts of leaves and flowers of *L. camara* were reported against 3rd and 4th instar larvae of *Ae. aegypti* and *Cx. quinquefasciatus* mosquito. Both extracts exhibited significant larvicidal activity against both species of mosquitoes, however, at low concentrations (1mg/ml) extracts were highly active against *Ae. aegypti* than that of *Cx. quinquefasciatus*. [31]

Antifilarial activity:
Antifilerial activity of crude extract of *L. camara* stem was reported. The extract and its chloroform fraction resulted in the death of adult *Brugia malayi* and sterilised most of the surviving female worms in the rodent model *Mastomys coucha*. [32]

Antiinflammatory activity :
Aqueous extract of *L. camara* was reported for anti-inflammatory activity in albino rats. Extract treatment (500mg/kg body weight) significantly decreased paw volume in carrageenan induced paw oedema test in rats. [33]

Anti fertility activity (Embryo toxicity):
Effects of hydroalcoholic extract *of L. camara* leaves was studied on fertility, general reproductive performance and teratology in female albino Wistar rats. The extract interfered in the frequency of fetal skeleton anomalies from

dams treated with the extract and induced embryotoxicity as indicated by post-implantation loss, without any signs of maternal toxicity. [34]

Antiurolithiatic activity:
Ethanolic extract of the leaves of *L. camara* was reported for antiurolithiatic activity against ethylene glycol and ammonium chloride induced calcium oxalate urolithiasis in male albino rats. Extract treatment significantly reduced the deposition of calcium, oxalate and also reduced urinary excretion of calcium, oxalate and creatinine. [35]

Anticancer and antiproliferative activity:
Oleanonic acid isolated from *L. camara* was screened for anticancer activity against a murine tumour (Ehrlich ascites carcinoma), and three human cancer cell lines, namely A375 (malignant skin melanoma), Hep2 (epidermoid laryngeal carcinoma) and U937 (lymphoma). Oleanonic acid exhibited promising cytotoxicity against A375 cells. [36]

Leaves of *L. camara* were reported to exhibit cytotoxicity effect on Vero cell line. *In vitro* cytotoxicity test was performed by MTT assay. The methanol extract (500 µg/ml) concentration inhibited the growth of cells 2.5 times less than did Triton 100 × 1%. [37]

Leaves of *L. camara* were reported for antiproliferative activity against HEp-2 (laryngeal cancer) and NCI-H292 (lung cancer) cell lines. In vitro antiproliferative test was performed by MTT assay. Methanol extract of *L. camara* leaves exhibited antiproliferative activity against NCI-H292 cells (% living cells= 25.8±0.19). [38]

Anti mutagenic activity:
22β-acetoxylantic acid and 22β-dimethylacryloyloxy lantanolic acid from *L. camara* showed antimutagenic activity. The antimutagenicity test was performed by micronucleus test in Swiss mice. Both compounds exhibited high antimutagenic activity in Mitomycin C induced mutagenesis in mice. [39]

Antioxidant activity:
Ethanolic extract of *L. camara* exhibited significant antioxidant activity in *in vivo* studies. The extract treatment decreased the extent of lipid peroxidation in the kidneys of urolithic rats. *In vitro* studied were carried out by DPPH radical scavenging assay and Nitric oxide free radical scavenging assay. Extract exhibited high antioxidant properties in both the assays. [35]

Antioxidant activity of the leaves of *L. camara* was reported by reducing power activity and 1, 1- diphenyl-2-picrylhydrazyl (DPPH) radical scavenging assay. Leaves extracts exhibited high antioxidant effect, however younger leaves exhibited strong antioxidant activity than the older or matured leaves. [18]

Toxicology:
L. camara is one among the most toxic plants known so far, possibly with in top ten. Reports of *L. camara* toxicity have been reported from Australia, India, New Zealand, South Africa and America. However, the toxicity occurs only on the consumption of high amount of plants material. It is reported that sheep, cattle and goats are susceptible to lantadenes A, B, D and icterogenic acid toxicity, where as horses, rats, neonatal calves and lambs are not susceptible to lantadene A. The prominent clinical sign of poisoning includes photosensitisation and jaundice. Loss of appetite in poisoned animals occurs within 24 hours and decrease in appetite also observed. The most severely poisoned animals die within 2 days of poisoning but usually death occurs after 1 -3 weeks after poisoning. The kidneys are swollen and pale in colour, the gall bladder is grossly distended and the liver is enlarged. The oral toxic dose of lantadene A for sheep is 60 mg/kg is toxic and 1–3 mg/kg by intravenous route. [40, 41]

CONCLUSION:

Ethnomedical and scientific reports about the medicinal properties of *L. camara* represent it as a valuable plant and establishing it as a candidate for the future drug development.

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