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Review Article

Review On Phytochemical and Pharmacological Investigation of Lantana Camara Extract

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ABSTRACT

Lantana camara is a member of the Verbenaceae family and can be found in various regions across India, including Jammu-Kashmir, Himachal Pradesh, Tamil Nadu, South India, Uttar Pradesh, as well as several parts of Maharashtra. The plant thrives primarily in disturbed areas such as roadside locations, railway tracks and canals. Although Lantana camara is an ornamental plant today; it was used traditionally for medicinal purposes in ancient times[1]. This plant has numerous traditional uses and its extracts have been utilized to heal wounds, cuts, skin irritations and eczema. Additionally, it contains various phytoconstituents including alkaloids, glycosides, saponins, steroids, terpenoids, carbohydrates, flavonoids, and coumarins. It boasts multiple pharmacological activities such as antioxidant properties, antimicrobial activity, antibacterial effects, antifungal characteristics, antiulcerogenic traits, anthelmintic qualities, anti-hyperglycaemic features, anti-inflammatory benefits, analgesic effects, anticancer properties, antitubercular functions etc., while also demonstrating mosquito larvicidal activity. Lantana camara is widely known for its effectiveness in treating many diseases and forms an essential ingredient within folk medicinal preparations globally. Over recent decades, scientists from around the world have extensively studied both the chemical composition of whole plants along with their biological pharmacological activities. Different parts of the plant are employed to treat colds, headaches, chicken pox, eye injuries, whooping cough, asthma, bronchitis, arterial hypertension among other ailments.

INTRODUCTION

Lantana camara is a flowering ornamental plant belonging to the Verbenaceae family. It has long

been utilized in traditional medicinal preparations and is renowned for its ability to cure various ailments. This plant serves as a significant source

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of diverse classes of bioactive natural metabolites that have proven therapeutic benefits. Since ancient times, flowers have been used as pectorals for children, while leaves and fruits can be applied externally to treat skin diseases, cuts, and wounds[1-2]. The stems and roots are utilized for gargles and toothaches or even as toothbrushes due to their numerous reported medicinal properties such as anticancer activity, anti-inflammatory activity, antidiabetic activity, anthelmintic activity, antibacterial activity, antifungal activity et al.[3] Comprising seven species with six found in America and one originating from Ethiopia; *Lantana camara* is native to South America but can now be located in almost 50 countries worldwide where it may also be cultivated[4]. Also referred to as red sage, it remains a popular choice among gardeners[5]. seeking ornamental plants thanks largely due its woody stem structure which boasts an array of vibrant coloured flowers including white, pink and red; however, the plant does possess spines or prickles[6]. Through systemic analysis of these plants, a variety of bioactive molecules are discovered which could prove valuable resources when developing newer pharmaceutical products. Therefore, this has led to an increase in interest regarding pharmacological evaluations of different traditional systems of medicine. Plants like *Lantana camara* have undergone extensive research over the last few decades using advanced scientific techniques. The results indicate that they possess several medicinal properties such as antidiabetic activity ,anthelmintic activity ,antibacterial activity ,antifungal activity ,hepatoprotective activity antioxidant activity larvicidal activity etcetera [7-8].

Taxonomy[9]

Kingdom	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida

Subclass	Asteridae
Order	Lamiales
Family	Vewrbenace
Genus	Lantana
Species	Lantana Camara

Plant Description[10-11]

L. camara is a low erect or subscadent vigorous shrub with a tetragonal stem, a strong odor of black currents, and stout recurved pickles. The plant is found up to height 1 to 3 m and width of 2.5 m. Images of plants, flowers, fruits, front, and dorsal view leaf.



Fig.1 Lantana camara Plant

Leaves

Leaves are ovate or ovate-oblong, crenate serrate, acute or subacute, rugose above, and scabrid on both sides. The leaves are averagely 3–8 cm long and 3–6 cm wide and have a green color. Leaves and stems are roofed with rough hairs. Leaves are the main source of phosphorous and potassium when used as a green mulch.[1]Leaves are opposite, simple, with long petioles, oval blades which are rough and hairy and have blunt toothed margins (Figure 2c). The leaves of *Lantana camara* have a strong aroma.[5] Leaves are green and tough with fine hairs and have a pungent odor, and it have the ability to climb up to 15 meters with the help of support. It can easily grow in favorable conditions, and flowers usually appear in the month of March and August.[3]



Fig.2 Lantana camara leaves

Inflorescence

Pairs in the axils of opposite leaves inflorescences are produced, which are compact, dome-shaped 2–3 cm across, and contain 20–40 sessile flowers.[1]

Flowers

Flowers of *L. camara* are small habitually yellow or orange altering to red or scarlet, in dense axillary heads. The calyx is small, corolla tube slender, the limb spreading 6–7 mm wide and divided into unequal lobes. Stamen is four in two pairs, which included ovary two ovules, two-celled. Flowering arises between August and March, or all-around year if suitable moisture and light are available and small flowers are held in clusters. Color is usually orange, sometimes varying from white to red in various shades and the flowers usually change colors as they age. In the axillary head, flowers are having a yellow throat almost throughout the year. It can easily grow in favorable conditions.



Fig.3 Lantana camara Flower

Fruits

The ripe fruits are heavily consumed by birds and frequently eaten by humans in some countries. The

color of the fruit is green and drupaceous with two nutlets. Mature plants produce up to 2000 seeds annually.



Fig. 3 Lantana camara Fruits

Root

The root system of this plant is very strong and even after repeated cuttings; it gives out new fresh shoots. The roots of *L. camara* are very strong, having a main taproot with many small side roots.

Ecology

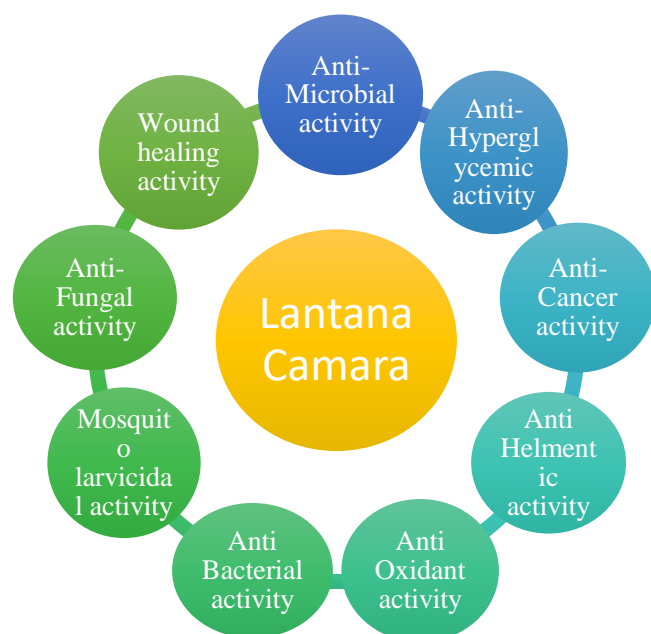
L. camara is collected from an area that has about 250 mm to 2900 mm of rainfall; it grows on all types of well-drained soil. It tolerates salt spray and keeps out in a dry period very well. Aerial portions of the plant are killed by temperatures of -2°C but quickly grow back. It is colonizing disturbed areas because they are an intolerant pioneer [12]. The species of that plant occur in varied habitats at open unshaded regions which include forests, rainforest edges, roadside, railway tracks and canals (Sharma et al., 2005; Kohli et al., 2008; Dogra et al., 2010). Anthropogenic activity further aggravates the invasion and allows it to spread (Day et al., 2003). The two principal ingredients for successful establishment are its growth under varied climatic conditions and no cap on temperature or rainfall limit [13].

Phytochemical Constituent

Parts of *L. camara* such as leaf, stem, and roots contained flavonoids, alkaloids, tannin, protein, catechin, phenol, saponin, steroids, anthraquinone, reducing sugar, and several tri-terpenoids which

contain various important phyto molecules such as verbascoside, linaroside, lanatoside, umuhengerin, ursolic acid, carminic acid, caprylic acid, and phytol. These are mostly responsible for using various biological activity[14-15]. the elements of essential oil of Lantana are sabiene, β -caryophyllene, α -humulene, 1,8- cineole and 8-hydroxy bicycle germacrene, caryophyllene, 1,8-cineol, two rare sesqui-terpenoid humulene epoxide-III, and sabinene [16] Chemical investigation of the flower and leaves extract to give knowledge of similar lipid and carbohydrate compositions. The flowers carried out carbohydrates more than leaves, although the lipids were more in the leaves extract [17]. Pentacyclitriterpenoids (camangeloyl acid, methyl camaralate, and camaryolic acid), octadecanoic acid, palmitic acid, camaric acid, β -sitosterol 3-o-beta-D- glycopyranoside, docosanoic acid, lantanolic acid, oleanolic acid, icterogenin, lantadene.

PHARMACOLOGICAL STUDIES



1. Anti-microbial Activity

Kedar et al. (2012) studied that, in vitro antimicrobial activity of dried leaves extract of L. camara on species of Escherichia coli, Bacillus

subtilis, and Staphylococcus aureus by the Agar Plate Method. Four types of solvent extracts can be used for maximum zone inhibition. On ethyl acetate extract showed resistant by S. aureus and E. coli. Aqueous extract showed resistant by B. subtilis. Methanolic extract showed moderate, aqueous extract showed minimum, and ether extract showed the highest antimicrobial activity[18].

2. Anti-hyperglycemic Activity

Different extracts of L. camara has been proved effective and digestive antihyperglycemic activity. Additionally, the hypoglycemic activity of methanolic extracts of the fruit was tested in streptozotocin-induced diabetic rats. As a result, a dose-dependent reduction was seen in the glucose level of serum as well as development in body weight, HbA1c profile and liver cells regeneration in streptozotocin induced diabetic rats[19]. Ganesh et al. (2010) studied that, in vivo anti-hyperglycemic activity. Oral administration of a methanol extract of L. camara leaves in alloxan-induced diabetic rats showed significant dose-dependent reduction of blood glucose concentration and also promising anti-hyperglycemic activity against alloxan-induced diabetic rats [20].

3. Anti-helminthic Activity

Helminths, also known as parasitic worms, are pathogens of great importance Worldwide. Nowadays, billions of people, especially in the least developed countries, are infected with soil-transmitted helminths. Helminths infection is also a severe problem in Livestock production globally and has caused significant loss to the economy as well as Threatened food security. In order to find a solution for such serious problems, L. camara was selected for its anthelmintic activity against Pheretima posthuma. An ethanolic extract was made using the stem of L. camara L. and subjected for investigation of anthelmintic potential. The analysis showed a significant result

at 500 mg/ml dosage when compared to standard drug Albendazole at 20mg/ml concentration[21].

4. Anti-oxidant Activity

Ethanol 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[22]. The extracts scavenged DPPH radical and prevented Fe²⁺-induced lipid peroxidation in rat's brain and liver homogenates, and this was likely not attributed to Fe (II) chelation[23].

5. Anti-cancer 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)[24]. A crude extract of *Lantana Camara* leaves had a cytotoxic effect on HeLa cells at 36 hours to 72 hours by employing the 2-5 Diphenyltetrazolium bromide cell viability assays. The result showed that an increase in the concentration or duration of the extract treatment was effective in killing cancer cells[25].

6. Mosquito larvicidal activity

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 *Cxquinquefasciatus* mosquito. Essential oil from the leaves of *L. camara* was reported to possess adulticidal activity against *Aedes aegypti*, *Culexquinquefasciatus*. Further studies on adulticidal activity of the essential oil was carried out on 0.208 mg/cm² impregnated paper along with 0.05 per cent deltamethrin impregnated paper used as positive control against female *Ae. aegypti*, *Cx. quinquefasciatus*, *An. culicifacies*, *An. fluviatilis* and *An. Stephensi*[26].

7. Anti-Fungal Activity

Antifungal potential of *L. camara* was screened against *Alternaria* sp. Which causes different plant

diseases especially in vegetable plants. Mudasir et al. (2017) studied that, in vitro antifungal activity of *L. camara* leaf extract with successive extraction using different solvents, acetone, chloroform, ethanol, and methanol. For this antifungal activity research used the poisoned food technique. 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[27] 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%)[28].

8. Anti-Bacterial 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 varieties of *L. camara* exhibited significant antibacterial activity against *E. coli*, *Bacillus subtilis* and *P. aeruginosa* whereas poor antibacterial activity against *Staphylococcus aureus*[29]. Ethanol 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*, *Vibrio cholerae*, *Escherichia coli* and two multi resistant strains *E. coli* and *S. aureus*. 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*[30].

9. Wound healing activities



Abdulla et al. (2009) studied that in vivo wound healing activity of Ethanolic leaf extract on adult male Wistar rats. Topical application Of ethanolic leaf extract on wounds showed increasing wound healing Activity. Using excision wound model aqueous extract of leaf showed Significant wound healing activity in rats. Topical application of The extract on the wound significantly increased the rate of wound Contraction, synthesis of collagen, and decreased wound healing Time[31].

CONCLUSION:

There is a high increase in demand for herbal drugs nowadays. Plants are famous for possessing many chemical moieties with a lot of pharmacological properties. The plant has many traditional as well as potential uses. pharmacological activities majorly antioxidant, antibacterial, anti-inflammatory, analgesic, anticancer, etc., and also has some medicinal properties to cure various diseases. The present review provides the detail information about active constituents present in Lantana Camara and their medicinal uses.

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