Phytochemical and Pharmacological Potential of Lantana Camara Linn

Vaishali Naphade¹, Jayesh S. Bhamre², Manoj M. Avaghade², Mansi S. Kale², Atul R. Bendale², Sandhya L. Borse¹ and Laxmikant B. Borse²

¹School of Pharmaceutical Sciences, Sandip University, Nashik, India
²Sandip Institute of Pharmaceutical Sciences, Nashik, (MH) 422213, India

Abstract: Traditional medicine and medicinal plants, as well as their study of modern chemical principles, may lead to the creation of newer and less expensive medications. This overview incorporates all aspects of Lantana camara Linn that other papers have overlooked. Lantana camara Linn is also a widespread weed and a famous ornamental plant. It is noteworthy that plants have long been an excellent source of medicine. Lantana camara (L. camara) is well-known for its many ailments, such as cuts, inflammation, ulcers, cataract, itching, eczema, and arthritis. Various parts of the Lantana camara plant are used medicinally for colds, coughs, pox, bronchitis, and hypertension. In addtion, L. camara scientifically studied various therapeutic activities such as antibacterial, antioxidant, antipyretic, larvicidal, antifungal etc. Over the past few decades, scientists and researchers worldwide have expanded their knowledge and studied the chemical composition of the entire L-plant and their medical activities. It is also known as a plant that produces essential oil, and essential oils are available in the market, known as Lantana oil. The phytoconstituents found in all portions of L. camara have been documented in various publications. Over the last few decades, scientists and researchers worldwide have thoroughly investigated the chemical content of the entire L. camara plant. The plant is widespread in Uttarakhand, Uttar Pradesh, Himachal Pradesh, and India’s north-eastern provinces. This paper examined the phytochemicals found in L. camara. The review focuses on this plant’s traditional usage, chemical constituents, pharmacological activity, and toxicology and other potential uses. This study aims to provide a comprehensive report on the literature on its phytochemistry and pharmacological action.

Keywords: Lantana camara Linn, Pharmacology, phytochemistry, oleanonic acid, Lantadene A and B, essential oil

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1. INTRODUCTION

Medicinal plants have a significant source of medically important compounds. Since ancient times, medicinal plants have been used to cure several types of health problems and various kinds of diseases. *Lantana camara* Linn. is a flowering ornamental plant belonging to the family Verbenaceae. It is also known as red sage, Lantana, Wild Sage, Surinam Tea Plant, Spanish flag, and West Indian lantana. This plant is used as a popular ornamental plant in gardens for decoration.

1.1. Physical Appearance

It is a smelling shrub, and structurally this plant's leaves are opposite to others and have a shape with a size of 2-10 cm (length) and 2-6 cm (width). The leaves are green and have finer hair, simple with large petioles, and oval blades that are rugged and hairy with bluntly toothed margins. In the fruit part (figure 1), the plant's Berries are round and fleshy and have two-seeded bean shapes. Seeds of *Lantana camara* L. are green in colour, turning purple and turning to a blue-black colour. The leaves are green and are 3-8 cm long and 3-6 cm broad. Rough hairs cover the leaves and stem. Clusters of little flowers (called umbels). The colour is generally orange, although it can range from white to red in varied tints, and the flower's colour changes as it ages. Throughout the year, flowers with a yellow neck appear on the axillary head. The calyx is short, the corolla tube is slim, and the limb is 6 to 7 mm in diameter and split into uneven lobes. Stamens four in two pairs, ovary two-celled, two ovulated. In the axils of opposing leaves, inflorescences are formed in pairs. The inflorescences are dense, dome-shaped, and 2-3 cm wide, with 20-40 sessile flowers.

1.2. Geographical Distribution

The plant grows significantly in favourable conditions, and flowering occurs from March to August. This plant is mainly found in tropical and subtropical regions. Mature plants give 2000 seeds throughout the year. *Lantana camara* is named differently in different languages of India, such as Raimuniya in Hindi, Kakke and Natahu in Kanada, Arippu and Unichedi in Tamil, Aripoov, Pochedi, Thirei, Samballei, Chaturanga and Yanacehdi in Sanskrit, Nongballei in Manipuri, Tantani and Ghaneri in Marathi and Pulikam in Telugu.

1.3. Uses

*Lantana camara* is commonly used as a herbal medicine and, in some regions, as firewood. The leaf oil is used as an antiseptic for scars or wounds; the roots are used for treating a toothache, and the flowers for chest pain issues in children. *Lantana camara* leaves extract exhibited anti-proliferative, antimicrobial, fungicidal, insecticidal and nematicidal activities, as antispasmodic, tonic, and antiemetic, to treat respiratory infections (Table 5). Most previous reports have described the antifungal and antimicrobial activities of *L. camara* showed germicidal activity observed by Verma and Verma (2006). The present review aims to document the phytochemistry and pharmacological evaluation of Lantana camara Linn and the prospects for further scientific investigation of the therapeutic compounds. The taxonomic classification is given in Tables 1, 2, 7.
1.4. Synonyms of Lantana camara

Lantana aculeate, Camara vulgaris, Lantana indica Roxb., Lantana salvifolia Jacq., Lantana trifolia, Lantana orangemene, Lantana tiliaefolia Cham, Lantana achyrantifolia Desf., Lantana montevidensis Briq., Lantana viburnoides Vahl

1.5. Phytochemistry of Lantana camara

Primary and secondary metabolites like alkaloid, glycoside, tannin, resin, saponin, cardiac glycoside, carbohydrate, steroids, phenol, coumarin, terpenoids, flavonoid and anthraquinones are present, which are identified by the identification tests for them. Because of the existence of natural agents, Lantana camara has therapeutic potential. Most of their activity is due to bioactive components such as saponins, alkaloids, tannin, anthocyanins, flavones, isoflavones, flavonoids, coumarins, lignans, catechins, iso-catechins, and triterpenoids (Table 4). Wollenweber et al. discovered and reported the presence of two triterpenoid esters, camarilic acid and camaricinic acid. Silva et al. found the chemical makeup of essential oils gathered from several places in 1999. The main ingredients in Lantana camara oil were - phellandrene, germacrene-D, limonene, caryophyllene, sabinene, α-zingiberene, and humulene.

1.6. Isolation of constituents from the leaves

Pan WD, in 1993 isolated six ingredients from the leaves of Lantana Camara. This chemical constituent was identified as oleanonic acid, lantadene A, lantadene B, Lantanilic acid, lcterogenin and 4',5-dihydroxy-3,7-dimethoxyflavone-4'-O-glucopyranoside (also known as Camaro side, Figure 2b). This phytoconstituents content in plants is influenced by the various factors like geography, season, genetic factor and developmental stages of the plant.

1.7. Isolation of constituents from the Roots

From the ethanolic extract of lantana camara stachyose, verbascose, jegs, verbascotetraose, alpha-D-gala (1--6)-alpha-D-gala (-1(3)-6-D-gluc(also known as Lantanoside A), alpha-D-gala-(1-6)-alpha-D-gala (1)-(4)-6-D-gluc(also known as Lantanoside B), the side, 8-epiloganin, shanzhsid methyl ester, theviridoside, lamiridoside and genocide have isolated the help of different types of spectral analysis in which 6 are oligosaccharides, and 6 are iridoid glucosides.

1.8. Isolation of constituents from the aerial parts of the plant

New pentacyclic triterpenoids 22β-acetoxy-3,25-epoxy-3α-hydroxyolean-12-en-28-oic acid (lancamarinic acid) and methyl 3,25-epoxy-3α-hydroxy-11-oxy-22β-senecioyloxyolean-12-en-28-oate (lancamarinin)12,13. Triterpenoids were also isolated from the Lantana camara, identified as lantanolic acid, 22 beta-O-angeloyl-lantanolic acid, and 22 beta-O-angeloyl-oleanolic acid, --βbeta-O-senecioyl-oleanolic acid, 22 beta-hydroxy-oleanolic acid, 19 alpha-hydroxy-ursolic acid and 19 alpha-hydroxy-ursolic acid (lantaiursolic acid)14. The study by R.K. Singh, B. Tiwari, Uma Sharma and S.P. Singh in 2012 found the actual content percentage in the leaf and fruit oil of the Lantana camara as shown below in table 2.

![Chemical structure of (a) Oleanonic acid (OA) and (b) Camaroside](image)

![Fig 2: Chemical structure of (a) Oleanonic acid (OA) and (b) Camaroside](image)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Constituent</th>
<th>% Content of leaf oil from India</th>
<th>% Content of leaf oil from Bangladesh</th>
<th>% Content of leaf oil from South China</th>
<th>General % Content of fruit oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>β-caryophyllene</td>
<td>9.40%</td>
<td>13.57%</td>
<td>12.35%</td>
<td>21.42%</td>
</tr>
<tr>
<td>2</td>
<td>Germacrene</td>
<td>20.50%</td>
<td>10.88%</td>
<td>6.19%</td>
<td>2.19%</td>
</tr>
<tr>
<td>3</td>
<td>β-elemene</td>
<td>7.30%</td>
<td>-</td>
<td>-</td>
<td>0.94%</td>
</tr>
<tr>
<td>4</td>
<td>α-humulene</td>
<td>-</td>
<td>11.76%</td>
<td>9.31%</td>
<td>9.97%</td>
</tr>
<tr>
<td>5</td>
<td>α-copaene</td>
<td>5.00%</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Sabinene</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.13%</td>
</tr>
</tbody>
</table>
1.9. **Isolation of essential oil**

β-caryophyllene (Figure 3), α humulene, germacrene, davanone and γ-curcumene were isolated from the essential oil of fresh leaves of lantana camara by gas chromatography (GC) and gas chromatography/mass spectrometry (GC/MS). The content of essential oil from fresh leaves of Lantana camara is shown in Table 3.

![Fig 3: Chemical structure of beta-caryophyllene](image)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Components</th>
<th>% of content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>β-caryophyllene</td>
<td>23.3%</td>
</tr>
<tr>
<td>2</td>
<td>α-humulene</td>
<td>11.5%</td>
</tr>
<tr>
<td>3</td>
<td>Germacrene D</td>
<td>10.9%</td>
</tr>
<tr>
<td>4</td>
<td>Davanone</td>
<td>7.3%</td>
</tr>
<tr>
<td>5</td>
<td>γ-curcumene</td>
<td>6.3%</td>
</tr>
</tbody>
</table>

In 2015, S. begum and others isolated a new triterpene from the Lantana camara, lancamarolide. In 2006, a pentacyclic triterpene, lantacin, camarinin and coumarin were isolated from the Lantana camara.
PHRLLA-NDRENE F49

SABINENE 50-52

LANTACIN50-52

CAMARIN50-52

CAMARININ53

α-CADINENE54

β - ELEMENE54

γ - ELEMENE54
1.10. Pharmacology of Lantana camara

- **Anti-bacterial activity**

Different types of leaves and flowers of *L. camara* plants reported antibacterial activity. Three other solvent extracts of four different leaves and flower varieties of *L. camara* exhibited an important antibacterial activity. These four different varieties are - *E. coli*, Bacillus subtilis and *P. aeruginosa*, while less antibacterial activity against *Staphylococcus aureus*. Ethanolic extract of *L. camara* leaves and roots were reported for antibacterial activity. In vitro antibacterial function is done in the form of microdilution. Extract showing antimicrobial activity against *Staphylococcus aureus*, *Proteus vulgaris*, *Pseudomonas*...
Staphylococcus aureus, Proteus vulgaris, Pseudomonas aeruginosa, Vibrio cholerae, Escherichia coli, and two resistant against many species is E. coli and S. aureus21.

- **Anti-inflammatory Activity**

The aqueous extract of aerial parts of the plant Lantana camara was examined for analgesic (hot plate method), anti-inflammatory (carrageenan-induced paw edema test) activities in albino rats by oral and topical routes, respectively. It exhibits the influence of Lantana camara aqueous extracts on the latency time for paw licking in response to heat stimulation. The rats demonstrated a substantial impact when treated with Lantana camara (500 mg/kg), with the leaking time increasing following treatment. Demonstrated anti-inflammatory action showing that oedema generated by carrageenan in rat’s paw increased in the control group. Treatment with Lantana camara aqueous extract (300 mg/kg) resulted in a slight drop in paw volume. In contrast, treatment with 500 mg/kg resulted in a considerable decrease.22

- **Antipyretic Activity**

The antipyretic activity of L. Camara was determined using ethanolic and ethyl acetate extracts. The results showed a decrease in body temperature from 1.5 hours. However, the activity of both antipyretic agents was significant (P < 0.01) between the 2nd and 3rd hour compared to negative controls. The antipyretic activity of Lantana camara could be at least partly due to COX-1, and COX-2 enzyme inhibition and free radical-scavenging activities, which may be attributed to the presence of flavonoids and other polyphenols in the extracts. The results of this study provided scientific support for the use of Lantana camara in the treatment of Pyrexia23.

- **Anti-helminthic Activity**

Helminths, also known as parasitic worms, are essential germs worldwide 24. These days, billions of people, especially in less developed lands, still survive infection with helminths transmitted to the ground. Infection of helminths is also a significant problem. Livestock production around the world has also caused substantial economic losses and the availability of threatening food. To find a solution to such a significant problem, L. camara was chosen for its anthelmintic work against Pheretima Posthuma. Ethanol emissions are made using the L.camara stem and are subject to anthelmintic force investigation25. The analysis showed a significant effect at a dose of 500 mg/ml compared to conventional medicine albendazole in 20 mg/ml concentration.

- **Antifungal Activity**

Antifungal power of L. camara tested against them Alternaria sp. causing various plant diseases. The antifungal function was made by three food poison plate method extract concentrations: 10 mg/ml, 15 mg/ml and 20 mg/ml. The 20 mg/ml dose of L. camara has shown important antifungal activity against Alternaria sp.26. Antifungal activity of ethanol of L. camara was tested with destructive white wood and brown mould. Both episodes showed antifungal effect activity against white rotting red mould, yet ethanol. Therefore, the extract had great potential at low concentrations (0.01%)27.

- **Antihyperglycemic Activity**

Antihyperglycemic activity is also performed using prepared methanolic extract from L. camara leaf tissues under alloxan diabetic rats. The release was administered orally (400 mg/kg), and results show a decrease in glucose levels at (121.94) mg/dl in the blood of diabetic rats with alloxan. 28 Take the treatment in 100 doses, and a body weight of 200 mg/kg led to a dose-dependent decrease in glucose levels in serum in synthetic streptozotocin mice with diabetes. Exhaust therapy also showed improved body weight, HbA1c profile and liver regeneration cell 29.

- **Antiulcerogenic Activity**

To determine the antilulcerogenic potential of L.camara, a methanolic extract was prepared, and its experiments were performed with aspirin-induced gastric ulcerogenic in mice with pylorus ligated, ethanol-induced gastric ulcer, and duodenal ulcer models of cysteamine. Two oral doses were given at 250 mg/kg and 500 mg/kg. The results of L. camara extract showed a significant decrease (P < 0.01) in the ulcer index and total acidity as well substantial (P < 0.01) increase in gastric pH of aspirin + pylorus-ligation induced ulcerogenesis and ethanol-induced gastric ulcer models. Thus it concluded that the leaves of L.camara have the potential healing of stomach ulcers and can prevent intestinal ulcers in mice28. In another study, methanolic extract from leaf tissue was corrected, and the effect was read on aspirin, ethanol, and stress-induced gastric ulcers in rat models. The results reveal antilulcerogenic activity in a dose-dependent manner and reduce the dose of stomach juice, total acid, and free acid but showed significant improvement (P < 0.001) in pH stomach ulcer levels caused by aspirin. When the previous treatment was given in two doses (200 and 400 mg/kg), the wound protection effect was observed with a protective percentage (63.31%,71.02%) aspirin-induced, (85.79%, 93.09%) ethanol-induced and (46.86%, 63.90%) protection in stress-induced wound models. It was shown that the extract has in vivo antioxidiant capacity as an increase was observed in superoxide dismutase (SOD) and catalase, which reduces glutathione (GR) activity in the treated group 29.

- **Anti-filarial Activity**

Antifilarial activity of L extract crude L. camara stem was to save. The extract and its component chloroform caused the death of an adult Brugia malayi and closed many germs and female worms surviving Mastomys mouse model house. The extract was also found effective against a subcutaneous rodent filarial Acanthocheilonema vitae maintained in Mastomys coucha, which exerted microfilaricidal solid (95.04%) and sterilization (60.66%) efficacy with mild macrofilaricidal action. Oleanolic acid (Fig. 2a) and oleanolic acid, isolated from hexane and chloroform fractions, showed LC100 at 31.25 and 62.5 mg/ml, respectively, on B. malayi in vitro. This is the first-ever report on the anti-filarial efficacy of L. camara.22

- **Anti-cancer Activity**

The leaves of L. camara were reported to show a cytotoxicity effect on the Vero cell line. In vitro cytotoxicity testing was performed for MTT testing. Methanol extraction (500 µg / ml) inhibits cell growth 2.5 times less than Triton 100 × 1% . in 2 weeks, L. camara leaf extract showed no
The antispasmodic effect of Lantana camara leaf extract to find the components and GC/MS analysis was carried out on methanol flower and terpenoids and cardiac glycosides have also been observed, increased to 3.0 mg/ml. The presence of saponin, flavonoids, exposed for 24 h. In the case of Culex quinquefasciatus, the maximum mortality was observed in Aedes aegypti 24 h. With a 1.0 mg/ml concentration of extracts of Lantana camara, the heart and kidney. The biochemical liver function tests showed significantly elevated TBIL and ALT in L. camara, while a total of flavonoids was (53.112 ± 0.199) mg/g dry weight. The leaf piece of L. camara demonstrated good hydroxyl drainage operations (45–73%) at a concentration of 0.2–0.8 mg/ml in the reaction mixture. Leaving quotes has shown a reduction-based ability to concentrate. It induces a reduction potential is 0.8 mg/ml 39. Ethanolic extract of L. camara has shown important antioxidant activity in vivo studies. Released treatment reduces lipid peroxidation in the kidneys of urolithic mice. In vitro research is performed by DPPH radical scavenging assay and nitric oxide free radical respiratory tests. The extract is indicated for its high antioxidant properties in both experiments 40.

- **Larvical Activity**

The larvical activity of mosquito extracts prepared using the leaves and flowers of L. camara. Camara L. in methanol and ethanol is well processed. Larvicidal effects on 3 and 4 instar larvae of mosquito species Aedes aegypti and Culex quinquefasciatus have been investigated dose-dependent for 24 h. With a 1.0 mg/ml concentration of extracts of Lantana camara, maximum mortality was observed in Aedes aegypti exposed for 24 h. In the case of Culex quinquefasciatus, the mortality was seen as maximized when the concentration increased to 3.0 mg/ml. The presence of saponin, flavonoids, terpenoids and cardiac glycosides have also been observed, and GC/MS analysis was carried out on methanol flower and leaf extract to find the components.

- **Effect of L. camara on GIT**

The antispasmodic effect of L. camara leaf constituents has been studied in the mouse ileum. Removal of methanic leaves of L. camara showed promising antispasmodic action on cut mouse ileum. Where acetylcholine was given where methanolic leaves extracted from L. camara, discharge caused a significant decrease in the shrinkage of the ileum, which indicates that the methanolic leaves of L. camara have antispasmodic properties activity by blocking cholinergic receptors39. It also has antimotility or anti diarrheal activity and antiulcerogenic activity36.

- **Hemolytic Activity**

The hemolytic activity of L. camara aqueous extract with the solvent components is made of modified spectroscopic methods in four different concentrations (125, 250, 500, and 1000 µg/ml). Aqueous extract and its solvent ingredients showed less hemolytic activity in many erythrocytes. Hemolytic activity of various extracts was obtained in the following order: part of chloroform>hexane and a portion of ethyl acetate (50:50) > aqueous extract > ethanol component > methanol component. In this study, they reported the hemolytic activity of L. camara to leave aqueous extract and its various solvent fractions. The results revealed that the leaves possess significantly less hemolytic activity and can further be used to isolate bioactive compounds. 37

- **Embryotoxicity or anti-fertility activity**

An effect of hydro-alcoholic extraction of L camara leaves was about reproduction, a normal reproductive function and teratology in female albino Wistar mice. Extraction disrupts the frequency of fetal skeleton anomalies from extract-treated dams, and embryotoxicity is created to indicate loss after implantation without any harmful symptoms to mothers. 38

- **Antioxidant Activity**

Antioxidant activity and hydrogen peroxide radicals are released, reducing energy, phenolic content, and flavonoid L content. In L. Camara, the total phenolic content was (40.859 ± 0.017) mg gallic acid / g in L. leaves. Camara, while a total of flavonoids was (53.112 ± 0.199) mg/g dry weight. The leaf piece of L. camara demonstrated good hydroxyl drainage operations (45–73%) at a concentration of 0.2–0.8 mg/ml in the reaction mixture. Leaving quotes has shown a reduction-based ability to concentrate. It induces a reduction potential is 0.8 mg/ml 39. Ethanolic extract of L. camara has shown important antioxidant activity in vivo studies. Released treatment reduces lipid peroxidation in the kidneys of urolithic mice. In vitro research is performed by DPPH radical scavenging assay and nitric oxide free radical respiratory tests. The extract is indicated for its high antioxidant properties in both experiments 40.

- **Wound healing Activity**

The wound-healing function of L. camara was reported in mice. Topical use excessively improved wound penetration rate (98%), consolidation of collagen and reduced wound healing time41. A thin coating of placebo was placed topically on Group 1’s wounds. Groups 2 and 3 animals had their wounds coated with a thin layer of placebo containing 5 and 10% L. camara extract, respectively. As a control, a slight coating of intrasite gel was given topically to the wounds of Group 4 animals. The effects of these topical applications on wound healing and histology were investigated. Wounds treated with a placebo containing plant extracts healed much faster than those treated with a blank placebo. Wounds treated with placebo extracts had much smaller scar breadth at the wound enclosure, significantly higher fibroblast proliferation and more mature and densely packed collagen with concomitant angiogenesis than wounds dressed alone with extracts. 42

- **Efficacy of wild sage (Lantana camara) extracts against almond moth (Cadra cautella):-**

One of the most economically important stored product pests is the almond moth (Cadra cautella) (Lepidoptera: Phycitidae). If not adequately handled, this bug causes significant harm directly by larval feeding on a range of dried fruits, preserved vegetables, and wheat seeds. Because they are natural substances, there should be no concerns with persistence in the environment. Thus, products based on plant extracts, phyto-oils, and purified plant components can be used as an alternative to traditional pesticides. Lantana camara is an evergreen hairy shrub grown as an ornamental hedge in Asia’s tropics, subtropics, and coastal areas. It’s also a major weed problem in tropical crops. The study aims to investigate the effect of L. camara leaf extracts on almond moth-infested ‘HS 420’ wheat seeds during storage. 45

- **Biological Control of Lantana camara**

The insect species brought into Australia and South Africa as prospective biological control agents of Lantana camara (lantana) were examined to identify characteristics that may...
have contributed to the large number of candidates that failed to establish on the plant. DNA investigations indicate that Lantana urticifolia and Lantana triifolia are more closely related to Lantana camara than other species of Lantana. Hence, a candidate’s native host may impact its establishment on Lantana camara. Eight species showed some preference for distinct lantana morphologies, whereas three species showed no importance for phenotypes. Future studies into the biological management of L. camara should investigate tackling these areas, which might result in higher candidate establishment rates and improved control of the parasite. 

- **Treatment of bovine dermatophilosis with Lantana camara**

It offers intriguing first findings on the therapeutic benefits of ointments created using medicinal plant extracts on bovine dermatophilosis. Our results suggest using ointments containing ethanolic extracts of Senna alata, Lantana camara, and Mitracarpus scaber leaves as topical therapies on chronic and acute dermatophilosis lesions to heal the condition in the nine afflicted animals treated without recurrence. This is in contrast to what was found when oxytetracycline, terramycin long-acting (TLA), or procaine-penicillin, antibiotics routinely used parenterally for the treatment of dermatophytosis in the Republic of Benin, were administered, which did not prevent the condition from recurring. When administered once a day for 8-15 days, these ointments caused the crusts to break off after 3-4 days of therapy. Hair develops on the treated regions, which recover without scarring 3-4 weeks after the treatment. The cured animals were free of dermatophilosis for more than three years and in good condition.  

- **Lantana camara for fuel ethanol production using thermotolerant yeast**

Lantana camara plant material was hydrolyzed with 1% sulfuric acid for 18 hours at room temperature, followed by a 20-minute heat treatment at 121 degrees Celsius. Hemicellulosic hydrolyzate was isolated and detoxified using ethyl acetate and overlining. The cellulosic fraction was hydrolysed for 18 hours at 55°C using Aspergillus niger crude cellulase enzyme. Acid and enzyme hydrolysat were combined and fermented using thermotolerant Saccharomyces cerevisiae (VS3). With a high fermentation efficiency, yeast fermented L. camara hydrolyzate to produce ethanol. Despite inhibitors in L. camara hydrolyzate, thermotolerant yeast consumed most of the sugars. 

### Table 5: Different formulations of Lantana camara with their uses

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Extracts</th>
<th>Pharmaceutical formulations</th>
<th>Biological role</th>
<th>References</th>
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<tbody>
<tr>
<td>1</td>
<td>Leaves</td>
<td>Herbal gel</td>
<td>Anti-inflammatory activity</td>
<td>Powar DP et al. (2013)</td>
</tr>
<tr>
<td>2</td>
<td>Leaves</td>
<td>Herbal Handwash</td>
<td>Washing and cleaning hands to remove soil, dirt and microorganism</td>
<td>Bhor RJ et al. (2018)</td>
</tr>
<tr>
<td>3</td>
<td>Leaves</td>
<td>Silver nanoparticles with extract</td>
<td>Wound healing activity, anti-inflammatory activity, antibacterial activity</td>
<td>Muniraja Lakshmi K et al. (2021)</td>
</tr>
<tr>
<td>4</td>
<td>Leaves</td>
<td>Herbal gel</td>
<td>Topical therapy on acne vulgaris</td>
<td>Dange VN et al. (2020)</td>
</tr>
<tr>
<td>5</td>
<td>Flower</td>
<td>Natural colourant</td>
<td>Natural colourant with preservatives for food, juices, etc.</td>
<td>Annegowda HV et al. (2020)</td>
</tr>
<tr>
<td>6</td>
<td>Oil extract from Flower</td>
<td>Ointment</td>
<td>The better alternative of Povidone-iodine, which has some delayed wound-healing action.</td>
<td>Satyajit Samal et al. (2017)</td>
</tr>
<tr>
<td>7</td>
<td>Leaves</td>
<td>Herbal Cream</td>
<td>Topical application on skin infection, antibacterial activity</td>
<td>Pandit D et al. (2017)</td>
</tr>
</tbody>
</table>

## 2. CONCLUSION

*L. camara* is a valuable medicinal herb with numerous applications in indigenous and traditional medicine. This report indicates that it has phytoconstituents that disclose its applicability for various therapeutic objectives. The herb or specific portions can be used to treat various human ailments, including antiulcer, analgesic, anti-inflammatory, anti-bacterial, anthelmintic, anti-cancer, anti-fungal, anti-microbial, and wound healing. Nonetheless, more research with the L. camara is necessary to examine the mechanism of action with other therapeutic activities. Therefore, this plant’s study has a lot of potentials.

## 5. REFERENCES

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