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# A REVIEW OF THERAPEUTIC PROPERTIES OF LANTANA CAMARA

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## ABSTRACT

The present research was aim to formulate and evaluate the herbal gel containing Lantana Camara leaf extract. Extracts of plant were incorporated into a gel base and evaluated for its physicochemical properties such as pH, viscosity, spreadability etc. The physicochemical evaluation of the developed formulation showed no lumps, had uniform colour dispersion and from any fibre and particle. It was also observed to have easy washablity and good spreadability. The antimicrobial activity for Lantana Camara using disc diffusion method was carried out. The antibacterial study of the Developed formulation showed dose/concentration proposed inhibitory activity against Staphylococcus aureus and Staphylococcus epidermis. The results concluded that the extract of Lantana Camara is an appropriate formulation for the topical therapy of acne vulgaris.

## INTRODUCTUIN

Resistance to antimicrobial 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 of L. camara. height. 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 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. Lantana camara Linn. Family Verbenaceae commonly known as wild sage, is a flowering shrub native of tropical America and is cultivated throughout the world as an ornamental [6]. Different parts of the plant are used in folklore remedies and traditional systems of medicine for the treatment of various human ailments. Over the last twenty-five years a large number of plant species have been evaluated for their antibacterial activity. One of the plants known for having many medicinal uses in traditional system of medicine is Lantana camara The leaves are used in the treatment of itches, cuts, ulcers, swellings, bilious fever, eczema and rheumatism. It has received attention due to its role in economy and ecology. It is serious weed in several countries that causes toxicity in grazing animals and is rapidly disturbing the ecological balance due to its luxuriant growth [8]. Many pharmacological investigations indicated that extracts of the leaves of exhibit antibacterial properties[2]

Superdivision: Spermatophyta
Division: Magnoliopsida
Subclass: Asteridae
Order: Lamiales
Family: Verbenaceae
Genus: Lantana
Species: Lantana camara
Parts Used: Apart from the whole plant, seeds, stem, root, leaves and flowers are also used.

## Synonyms:

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[3]

Figure:- leave and flower of lantana camara

## Antimicrobial Screening Assay:

The isolated plant extract was prepared for screening of antimicrobial activity by mixing 2-5ml (100%) of respective solvents in which the plant biomolecule has been isolated shaking for 15min. and then centrifuging for 15min. at

3000 rpm. The desired aliquots of the Methanol extracts were evaporated to half of their volume in a nitrogen flow in order to increase the concentration of the solvent. The respective extract (25ml) were applied to the surface of the seeded assay plates, which were incubated at entire 28 ± 20C (Yorco, India) or 370C ± 20C (bacteria). Inhibition zones around the application points were measured after 24hrs.(data not shown)

## Statistical Analysis

Each experiment was performed at least three times and the results are expressed as Means±SD. Data were analyzed by Duncan's Multiple Range Test (DMRT) with P values > 0.05 considered to be significant. FTIR Analysis: The HPLC purified sample were further subjected with IR Spectroscopy[4]

## Anticancer and antiproliferative activity

Different varieties of L. camara plant parts were reported for anticancer and antiproliferative activity. 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). 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% [3, 4].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 [5]

## Anti-Bacterial Activity

The Ethanolic extracts of Lantana camara leaves and roots for antibacterial activity. The in vitro antibacterial activity was performed by microdilution method. The extracts exhibited antimicrobial activity against Staphylococcus aureus, Proteus vulgaris, Pseudomonas maeruginosa, Víbrio cholareae, Escherichia coli and two multiresistant strains E. coli and S. aureus. Three different solvent extract of leaves and flowers of four different varities of Lantana camaraexhibited significant antibacterial activity E. coli, Bacillus subtilis and P. aeruginosa whereas poor antibacterial activity against Staphylococcus aureus[54]. The Methanolic extracts of different parts of Lantana camara for antimicrobial activity against 10 bacteria and 5 fungi by disk diffusion method and broth microdilution method. The leaves extract of Lantana camara showed highest activity against Gram positive Bacillus cereus and Gram negative Salmonella typhi[6]

## Antifungal activity

The methanol, diethyl ether, ethyl acetate, n-butanol, chloroform and aqueous extracts of L. camara leaves and flowers were screened against Trichophyton rubrum. Methanol extract showed maximum activity (98% inhibition) followed by ethyl acetate extract (85%), diethyl ether and n butanol (80%), chloroform (60%) against T. rubrum at 100 µg/ml, while aqueous extracts inhibited the growth of this fungus nat the same concentration by 32-44%. The activity of the methanolic extract was also determined against Microsporum canis, Microsporum gypseum, Trichophyton mentagrophytes, Trichophyton verrucosum, and Epidermophyton floccosum. Extract was very effective against all the tested fungi. The percent inhibition ranged from 50% to 80% [84]. Acetone extracts of different parts of L. camara were found to produce moderate to good antifungal activity against all phytopathogenic fungi (Penicillium janthinellum, Penicillium expansum, Aspergillus parasiticus, A. niger, Colletotrichum gloeosporioides, F. oxysporum, Trichoderma harzianum, Phytophthora nicotiana, Pythium ultimum, and Rhizoctonia solani) studied. Leaf extracts were more active than seed or flower extracts [85]. Antifungal efficacy of flavonoids (free and bound) and crude alkaloids of L. camara extracted from roots, stem, leaves, and flower was

determined by disc diffusion assay against Candida albicans (MTCC 183) and dermatophytic fungi T. mentagrophytes (MTCC 7687). Most susceptible fungus was C. albicans followed by T. mentagrophytes.[1,7] A blank well impregnated with Dimethyl sulphoxide (DMSO4) and Distilled water was used as negative control and Fluconazole (15µg/ml) as positive control. The plates were then incubated at 37°C for 24 hrs. The antifungal activity was assessed by measuring the zone of inhibition. The relative antifungal activity of the extract was calculated by comparing its zone of inhibition with the standard drugs (Karthikeyan et al.,2016). Pathological assay was done according to the plug method according to the methodology followed by Saxena et al.,(2013). The suspensions were adjusted by spectrophotometric method, adding saline solution, to reach the value of 0.5 in the McFarland scale corresponding to a final concentration of 3.0 ± 2.0×106 cells/ mL. Fungal colony diameter of treatments and control sets were measured and percentage of mycelial inhibition was calculated using the following formula:

Percentage of mycelial inhibition = [C – T / C] x 100. Where, C and T are the growth diameter (mm) in control and treatment

respectively. The minimum and maximum values were 0% and 100%.The Minimum inhibitory concentration (MIC) and Minimal

fungicidal concentrations (MFC) were estimated according to the methodology followed by Rachuonyo et al., (2016).[8]

## MOSQUITO CONTROLLING AVTIVITY:

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. aegyptithan that of Cx. quinquefasciatus. 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 LD50 values 0.06, 0.05, 0.05, 0.05 and 0.06 mg/cm(2) while LD90 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[9]

# Antioxidant activity

The antioxidant activity of the plant extracts and the standard were assessed on the basis of the radical scavenging effect of the stable, Diphenyl-2-picrylhydrazyl (DPPH) - free radical activity using a modified method of Blois, 195817. Different concentrations of the plant extracts and standard compound (ascorbic acid) were taken in 10mg, 20mg, 30mg and 40mg/ml of methanol solution. 0.002% of DPPH was prepared in methanol and 1 ml of this solution was mixed with 1 ml of sample solution and standard solution separately. These solution mixtures were kept in dark for 30 min. Optical density was measured at 517 nm using a UV- VIS spectrophotometer (Shimadzu, Japan). A control solution was prepared containing 1 ml of methanol and 1 ml of 0.002% DPPH. Methanol as blank was used to zero the spectrophotometer. Percentage of inhibition was calculated by using the formula given below.

Percentage (%) of inhibition (DPPH activity)

$$= \frac{A - B \times 100}{A}$$

Where A = optical density of the Control

and

B = optical density of the test.

Where, Control is the absorbance of DPPH radical and methanol

Test is the absorbance of DPPH radical + sample extract /standard.[10]

## Antimicrobial activity

The dried plant extracts were dissolved in the same solvent (acetone, Methanol or Methanol) to a final concentration of 30 mg/ml and sterilized by filtration through 0.45µm Millipore filters. Antibacterial (a set of Gram positive and Gram negative) and anti yeast test were then carried out by disk diffusion method [6], using 100 µl of suspension containing 108 cfu/ml of bacteria and 106 cfu/ml of yeast spread on nutrient agar and sabouraud dextrose agar

respectively. The disks (6mm) were impregnated with 10µl of the extracts (100µg/ml disk) and placed on the inoculated agar. Negative controls were prepared using the same solvents employed to dissolve the plant extract. Gentamycin sulfate (10mg/ml disk) was used as a positive reference standard to determine the sensitivity of one strain from each bacterial species. The inoculated plates were incubated at 35±10C for 24h for bacteria and 48h for yeast. Antifungal activity was determined by poisoned food technique was adopted to evaluate the effect of essential plant extract on the growth of human and plant pathogenic fungi. 20ml of sterilized and cooled (400C) growth media (PDA) with 10mg streptomycin were poured into pre sterilized Petri plates. Requisite amount of different concentration of plant extract like 100, 300, 500, 1000 µg were added into the plates. The assay plates were rotated carefully to ensure an even distribution of the oil in the medium. In control plates the medium was supplemented with sterilized distilled water to compensate the volume instead of plant extract. After the solidification of the agar medium, inoculums of the test organism[11]

## Antiproliferative assay

The antiproliferative effect of the alkaloids extrac- ted from L. camara was performed by MTT assay according to the Mosmann (1983) method [31] with minor modifications [32]. Briefly, 1.5 10 4 cells in one hundred microliters of fresh culture medium were seeded in each well of the 96-well plate and incubated overnight. The stock solutions of HPAF, AF, and CA were diluted with the media of the cell culture medium to obtain six serial dilutions (2.84, 5.67, 11.36, 22.72, 45.44, 90.88 mg/mL). One hundred microliters were applied to each well from each concentration. The medium was aspirated from wells after two days of the treatment, and 10% v/v of MTT solution (5 mg/mL in sterile PBS) were added to all wells and incubated for 3 h at 37 C in 5% CO 2 incubator. The formed for- mazan salts were dissolved in 200 ml DSMO added to each well. Absorbance was measured at a primary wavelength of 570 nm and a reference wavelength of 620 nm by using i-control™-Microplate reader equipped with a software (TECAN Group Ltd., Switzerland) for calculating the concentration form absorbance. The negative control (Blank) was 0.1% v/v DMSO solution. The results are expressed as a mean % inhibition to the negative control ± standard deviation.The assay was performed in quadriceps and the mean of results were calculated.[12]

## Pharmacological activities:

Lantana is basically used as an herbal medicine since long back reflected through documents in various literatures. All parts of this plant have been traditionally used for several ailments throughout the world. The plant extracts has been used in folk medicine for the treatment of cancers, chicken pox, measles, asthma, ulcers, swellings, eczema, tumors, high blood pressure, bilious fevers, catarrhal infections, tetanus, rheumatism and malaria. Further, used for the treatment of skin itches, as an antiseptic for wounds, and externally for leprosy and scabies have been documented. Beside this traditionally, Lantana is considered to be antiseptic, antispasmodic, carminative and diaphoretic agent.[13] Lantana is basically used as an herbal medicine since long back reflected through documents in various literatures. All parts of this plant have been traditionally used for several ailments throughout the world. The plant extracts has been used in folk medicine for the treatment of cancers, chicken pox, measles, asthma, ulcers, swellings, eczema, tumors, high blood pressure, bilious fevers, catarrhal infections, tetanus, rheumatism and malaria.[14]

## 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[15]

## Wound healing:

Wound healing is a dynamic self-recovery body mechanism, which involves a series of events like clotting, inflammation, granulation tissue formation, re-epithelialization, collagen synthesis and wound contraction. Healing of a clean uninfected surgical incision closed by surgical sutures, is referred to as healing by primary union or by first

intention. Re-epithelialization to close the wound occurs with formation of a relatively thin scar. In case of excision wounds, large defects on skin is created causing extensive loss of tissue. The healing of these wounds occurs by secondary union or by second intention, which involves a more intense inflammatory reaction with formation of abundant granulation tissue and extensive collagen deposition, leading to the formation of a substantial scar, which generally contracts.

Reducing the risk of infection through effective management of wound bio-burden is thus an essential aspect of wound care. Herbal products may be considered due to their decolonizing activity against a number of microbes. Soni *et al* had reviewed the herbal active constituents (tannins and flavonoids) as regards their wound healing activity. From time immemorial, it was well documented that weeds were the favourite alternative herbal medicaments for the mankind. Weeds produce secondary metabolites to protect themselves or produce allelopathic chemicals to inhibit growth of other plants.(7) *Lantana camara* is a significant weed comprising an array of active metabolites like alcohols, alkaloids, terpenes and terpenoids.(8) Several authors have reported antibacterial efficacy of *Lantana camara*, but no study had been carried out about its wound healing potential. Moreover, the Lantana weed extract used in this study was sourced from the local area which may be different from other reported varieties because of a geographical impact on variation of synthesis of active constituents due to disparity in genetic architecture of plants. In this background, this work was conducted to screen the wound healing activity of *Lantana camara* flower water distillate on rat models.[16]

## Anti-inflammatory activity:

Carragennan induced paw edema The overnight fasted rats administered both the extracts, after 1h the carragennan (1 % w/v) suspension administered in the right hind paw by sub-planter injection to induce the inflammation. The six groups were prepared, each group consists six animals. The first group received 0.9 % normal saline in 3% Tween 80 (2ml/kg), and served as negative
control, the second group received indomethacin (10 mg/ kg), and served as a positive control, the third and fourth group received 100 mg/kg and 200 mg/kg leaves extract, the fifth and sixth group received 100 mg/kg and 200 mg/ kg bark extract. After carragennan injection the animals were observed for change in paw volume at 0,1,3,4 and 5 h, the volume is measured by plethysmographically. Drugs were freshly prepared just before oral administration
Histamine induced paw edema The 0.1% freshly prepared solution of histamine was used to induce the paw edema to the right hind paw of rats by sub-plantar administration. The change in paw volume was recorded at 0 and 1 h after histamine injection. Animals were divided into various groups to receive the leaves and bark extract (100 and 200 mg/kg) with 0.9 % normal saline in 3% Tween 80 (2ml/kg) as a negative control and indomethacin were administered at 10 mg/kg dose and serve as positive control. Prior to eliciting the paw edema the drugs and extracts were administered.[17]

## Acute toxicity studies

*Lantana extract* at the dose of 2000 mg/kg does not exhibited
any signs of toxicity up to 14 days and no animals died upon oral administration. Therefore, the biological activity was carried out using 100 mg/kg and 200 mg/kg dose levels. [18]

## RESULT AND CONCLUSION:

Hydrodistillation of the air dried leaves of L. camara afforded oil yield of 0.2% (v/w). Thirty-one constituents, representing 74.8% of the oil were identified (Table 1). The main constituents were 1,8-cineole (15.8%), sabi- nene (14.6%) and -caryophyllene (8.9%). Other minor constituents were E-nerolidol (5.9%), bicyclogermacrene(2.8%) and -pinene (2.1%). The composition of the studied Lanatana camara specie is similar to those previously reported in Nigeria and Iran (Sefidkon, 2002; Kasali et al., 2004) but differ from species from North Brazil , in which limonene, -phellandrene germacrene, curcumene -zingiberen and -humulene are major constituents (da Silva et al., 1999).

**Table 1**. Antimicrobial activity of Lanatana camara L. from Nigeria.

| Microorganism | Minimum inhibitory concentration (ppm) | Zone of inhibiyion (mm) |
|---|---|---|
| P. aeruginosa | 10000 | 11 |
| P. mirabilis | 1000 | 10 |
| B. subtilis | 1000 | 12 |
| C. albican | 10000 | 14 |
| S. typhi | 10000 | 12 |
| B. aureus | 10000 | 11 |

[19]

According to the results demonstrated, it is concluded that the extract of the leaves of L. camara is a rich source of biologically active compounds analyzed in this study, namely tannins, flavonoids, alkaloids and saponis and presented a good antibacterial potwntial agains S. aureus and not for E. coli. And there was no relationship between the concentration of the extract and the diameter of the halo of inhibition og the evaluate mivroorganism.[20] The phytochemicals present in the extract were identified by qualitative phytochemical screening, which reveals the presence of alkaloids in chloroform extract, alkaloids, saponins, and carbohydrates in aqueous extract and alkaloids, proteins and flavonoids in the alcoholic extract. The preliminary pharmacological study showed that the ethanolic extract of Lantana amara Linn leaf possess maximum wound healing effect in rats and the effects produced was maximum in 10% alcoholic extract and this concentration was used for the formulation.[21] The essential oil of L. camara remarkably inhibited the growth of smost tested bacteria and fungi, P. aeruginosa, A. niger, F. solani and C. albicans appearing as the more sensitive.[22]

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