WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 13, Issue 14, 1152-1169. Review Article ISSN 2277–7105

LANTANA CAMARA: A REVIEW OF ITS ENVIRONMENTAL IMPACT AND MEDICINAL POTENTIAL

Aditya Wagh*, Chinmay Kapile Sir, Sakshi Daine, Sakshi Satpute and Prathmesh Wagh

India.

Article Received on
04 June 2024,

Revised on 24 June 2024,
Accepted on 14 July 2024

DOI: 10.20959/wjpr202414-33200

***Corresponding Author**
Aditya Wagh
India.

ABSTRACT

Lantana camara flowers were tested for their ability to repel Aedes mosquitoes. In coconut oil, lantana flower extract offered 94.5vo protection against Aedes aliopictus and Aedes iegyptt. A protection period of 1.9 hours was averaged. An application of lantana flower extract can offer protection from potential Aedes mosquito bites for up to four hours. Three months following the application, there were no negative impacts on the human subjects. Two insect pests of cowpea, C. maculatus and A. obtectus, and one insect pest of maize, S. zeamais, were used to assess the repellent properties of Lantana camara aqueous extract. The extract had a mean repellency of 39.9% on C. maculatus, indicating a weak repellency, according to the results. Mean repellency for S. zeamais was 33.3%, while A. obstectus was 24.4%. Given that each of the three test insects had a class repellency of 2, the extract did not exhibit exceptional repellent effects against any of them. Other organic solvents should be used to further investigate the extract on the test insects.

INTRODUCTION

Before the invention of synthetic chemicals, it was generally recognised that plants had the ability to repel mosquitoes and other pest insects (Curtis et al. 1989). Recently, a review was published on the application of botanical derivatives as a mosquito repellent (Sukumar et al. 1991). In recent years, electronic assemblies, rugs, and incense sticks have all gained a lot of popularity. Still, the majority of vaporising assemblies contain synthetic or natural pyrethroids (Vartak and Sharma 1993). Long-term use of mats and coils treated with insecticides may be hazardous to people's health (Liu et al. 1987). Adult mosquitoes are also

repelled by essential oils and terpenoids (Curtis et al. 1989). Neem oil has been shown by Sharma et al. (1993) to be an efficient and safe substitute for insect repellent.[1]

The woody weed plant Lantana camara Linn. (family Verbenaceae) comes in a variety of floral colours, including red, white, yellow, pink, and violet. The extremely resilient shrub Lantana camara grows luxuriantly in tropical, subtropical, and temperate regions of the world, reaching heights of up to 2,000 metres. The plant is widely distributed throughout the northeastern regions of India, the Himachal Pradesh region, the Jammu region, the hilly areas of Uttar Pradesh, and other areas where it has become a significant pest. Sharma et al. published a review on Lantana camara (1988). In this study, we describe how extracting ltrntana camara (red variation) flowers in coconut oil has an anti-Aedes mosquito impact.[2]

Phytochemistry

Because L. camara is a medicinal plant, researchers have looked into the chemical composition of every portion of the plant. The majority of chemical elements, including triterpenoids, alkaloids, flavonoids, tannins, saponins, and glycosides, were found to be present in the leaf extracts. Phytochemical analyses of the stem and fruit of L.camara were also conducted, despite the absence of leaves. From the stem and fruit, they reported terpenoids, flavonoids, saponins, and tannins. The fruit's n-Hexane fraction GC/MS analysis revealed the presence of the following chemicals. It was reported that the plant's root contains the significant bioactive chemical "Oleanolic acid," whose extraction process is protected by a patent. L. camara, also marketed as Lantana oils, is a product that is widely recognised for being a rich source of essential oils.[3]

Over the past few decades, a great deal of research has been done on the phytochemical content of L. camara. Essential oils, phenolic compounds, flavonoids, carbohydrates, proteins, alkaloids, glycosides, iridoid glycosides, phenyl ethanoid, oligosaccharides, quinine, saponins, steroids, triterpens, sesquiterpenoides, and tannin are reported to be the main phytochemical groups found in various parts of L. camara.[4]

Fig. no. 1:- Dorsal and ventral surface of leaves.

Fig. no. 2:- Flowers.

Fig. no. 3: Stem and Root.

Cultivation

Habitat

The species can be found in a range of settings, such as:

- Agricultural regions
- gaps and edges of forests
- Zones of riparian vegetation
- Grasslands
- Beach fronts and secondary forests

L. camara cannot withstand shade, it is rarely found in natural or semi-natural forest regions where it cannot compete with higher trees. Rather, it grows near the border of the forest. L. camara is able to withstand a broad variety of environmental factors, such as heat, humidity, salt, drought, and many types of soil. Additionally, it can swiftly establish itself in freshly burned forest regions and is fairly fire resistant.[5,6]

As an invasive species

The IUCN's "List of the world's 100 worst invasive species" includes L. camara. In many of the Paleotropic regions where L. camara has taken root, it is regarded as a weed. It has the potential to replace other native species and decrease biodiversity in secondary forests or agricultural areas by becoming the dominating understorey shrub.[7]

Because L. camara dense thickets inhibit the growth of new trees, they can considerably slow down the regeneration of forests. In tropical US states like Florida and Hawaii, L. camara is regarded as an invasive species. Although L. camara is itself quite resistant to fire, it can change fire patterns in a forest ecosystem by altering the fuel load, causing a buildup of forest fuel, which itself increases the risk of fires spreading to the canopy.[8]

This can be particularly destructive in dry, arid areas where fire can spread quickly and lead to the loss of large areas of natural ecosystem.L. camara reduces the productivity in pasture through the formation of dense thickets, which reduce growth of crops as well as make harvesting more difficult. There are also secondary impacts, including the finding that in Africa, mosquitos which transmit malaria and tsetse flies shelter within the bushes of L. camara.[9,10]

Despite being regarded as an invasive species in the Western Ghats, L. camara appears to have little effect on biodiversity in the area; instead, it primarily coexists with other species in the same damp areas.

Although there are other explanations for L. camara's success as an invasive species, the following are the main ones that have helped it to spread

1) Large distribution range enabled by drupe-eating Birds and Other animals
2) Less likely than not to be poisonous to animals
3) Tolerance to a broad spectrum of environmental factors

4) Growing logging and habitat change have helped L. camara, which favours disturbed ecosystems.
5) Creation of harmful substances to prevent rival plant species
6) Incredibly high seed yield—12,000 seeds year from each plan

Management and Control

Long-term control of the invasive L. camara plant will necessitate a decrease in actions that harm ecosystems. Preventing invasive species from establishing themselves and outcompeting native fauna and flora requires maintaining functioning (healthy) ecosystems.[11]

Biological

Attempts to manage L. camara have been made with variable degrees of success using insects and other biocontrol agents. It was the first weed ever to be biologically controlled, yet despite the deployment of 36 control agents spread across 33 locations, not a single programme has been successful.[12,13]

The numerous hybrid forms and high genetic variety of L. camara, which make it challenging for the control agents to efficiently target every plant, are probably the main reasons why biological control has not worked successfully in this situation. Tingid bugs are being used in a recent study conducted in India to control this plant biologically.[14]

Mechanical

Physical removal of the plants is required for mechanical control of L. camara. Physical removal is typically only appropriate in small areas or in the early stages of an infestation because it can be labor-intensive, costly, and effective. Replanting with natural plants after a fire treatment is another mechanical control technique.[15]

Chemical

Herbicide management of L. camara is very effective yet costly, making it unfeasible in many developing nations where L. camara is well-established. The best method for chemically treating plant species is to mow the area first, then apply a weed-killer spray; nevertheless, this may have detrimental effects on the ecosystem.[16,17]

Tradition use

Although lantana camara stalks have historically been employed primarily for medicinal and decorative purposes, they have also been utilised in the manufacture of furniture, including tables and chairs.[18]

Medicinal value

Lantana leaves have been shown to exhibit antibacterial, fungicidal, and insecticidal qualities in Indian studies. L. camara has also been utilised in traditional herbal remedies to cure a range of illnesses, such as ulcers, measles, cancer, skin rashes, chicken pox, leprosy, and asthma.[19]

Rats with stomach ulcers have demonstrated less development when L. camara extract is used.[20]

Ornamental

The reason lantana camara is grown as an ornamental plant now is because it was introduced to Europe by Dutch explorers in the New World. Its resilience to drought and lack of pests and diseases have made it a popular ornamental plant. It also lasts a fair amount of time without water. L. camara is commonly used in butterfly gardens and also attracts birds and butterflies. In colder climes, L. camara is commonly grown inside as an ornamental, however it can also flourish in a garden with enough cover.[21,22]

As a host plant

Several kinds of butterflies consume the nectar of L. camara. The largest butterfly in the western hemisphere, Papilio homerus, is known to be an opportunistic flower feeder and to consume nectar from flowers. Evarcha culicivora, a jumping spider, is related to L. camara. They use the nectar as sustenance and these plants as a preferred site for courtship.[23]

Mythology

The range of L. camera is from Cape Melville in north Queensland to Bega Shire in southern New South Wales. It can be found on the Norfolk and Lord Howe Islands. In NSW and QLD, the main infestations are located east of the extensive intermediate range.[25,26] The following regions are home to pink-edged red lantana:

1. The North Coast, in the vicinity of Kempsey; The Central Coast, southeast of Dorrigo, Bellingen; and Coffs Harbour and Grafton.

2. Red varieties are found along Kempsey, Bellingen, and Coffs Harbour on the North Coast.
3. It is unlikely that L. camera will spread to other parts of NSW. Within its range, it is spreading and becoming more denseh.
4. The tropical and subtropical regions of Central and South America are the origin of L. camera.

In 1841, it was brought to Australia as an ornamental plant. It was widespread in Brisbane and Sydney by the 1860s.[27,28]

Habit

L. camera is a member of the Verbenaceae family. Another name for it is a crimson sage. It can reach a maximum height of 1-3 metres and a maximum width of 3 metres. It's a deciduous shrub with many prickly stems.[29,30] There are opposite, simple, scented leaves with long petioles and round, rough, hairy blades at the borders. The green leaves measure 3-8 cm in length and 3-6 cm in width.[31] When they are crushed, a strong odour is released. Tiny, stalked flowers come in a variety of hues, including orange, blue, red, yellow, and vivid red.[32]

They are grouped densely in a flat-topped cluster, and the corolla has four short, spreading lobes on a narrow tube.[33] Weather conditions usually cause colour variations in flowers. Blooming takes place from March to August. The stem has a square shape and is hairy with bristles all over it. Soil is plunged up to 50–100 cm into the roots. They have a robust nature and are yellowish-whitish in colour. Berries are round, fresh, juicy, deadly, with two seeds, and a colour that changes from green to purple to blue-black over time. Because of their attractiveness, berries attract birds and insects. The berries are spherical, 6 to 8 mm in diameter, green while they are young, lustrous, and have one seed per fruit when fully ripe.[34]

Habitat

L. camera is a plant native to the tropics. It needs to be dispersed throughout a wide geographic area. Since it is a perennial shrub, its primary growth environments are open, disturbed spaces like canals, railway lines, and wayside.[35] It can grow very well under 750–5000 m of annual rainfall and can establish itself at elevations above sea level as high as 2000 m. It was born in the Caribbean and belongs to Central and Northern South America. It is presently present in sixty nations.[36] This plant is found in seven to ten states in India,

including Gujarat, Rajasthan, Goa, Maharashtra, Himachal Pradesh, Karnataka, Kerala, Uttar Pradesh, Uttarakhand, and Arunachal Pradesh. They need a lot of sunlight to flourish. Most of the time, they thrive in pH 4-9. sandy or loamy soil.[35,36]

Scientific claim

Antibacterial activity

There have been reports of antibacterial activity in the leaves and flowers of various kinds of L. camara plants. Significant antibacterial action was shown against E. coli, Bacillus subtilis, and P. aeruginosa by three separate solvent extracts of the leaves and flowers of four different varieties of L. camara; however, antibacterial activity against Staphylococcus aureus was weak.[37]

It has been claimed that ethanolic extracts of L. camara's roots and leaves have antibacterial properties. Using the microdilution method, the in vitro antibacterial activity was carried out. The antibacterial activity of the extracts was demonstrated against multiple strains of multiresistant E. coli and S. aureus, as well as Staphylococcus aureus, Proteus vulgaris, Pseudomonas aeruginosa, Víbrio cholareae, and Escherichia coli.[38]

The antibacterial activity of methanolic extracts from various sections of L. camara was tested using the broth microdilution method and the disc diffusion method against 10 bacteria and 5 fungi. The L. camara leaf extract had the best efficacy against both Gramme negative Salmonella typhi and Gramme positive Bacillus cereus.[39]

Antifungal activity

The ability of L. camara to inhibit fungi was tested against Alternaria sp., a common cause of various plant diseases, particularly in vegetable plants. Using the food poisoning plate method, the antifungal activity was tested at three distinct extract concentrations: 10 mg/ml, 15 mg/ml, and 20 mg/ml. L. camara demonstrated considerable antifungal efficacy against Alternaria sp. at a dosage of 20 mg/ml.[40]

The antifungal properties of L. camara's ethanol and hot water extract were tested against fungi that cause brown and white rot in wood. The two extracts demonstrated effective antifungal action against fungi that cause brown and white rot, although the ethanol extract showed the greatest promise at a relatively low concentration (0.01%).[41]

Antiulcerogenic activity

A study on rats with asprin, ethanol, and cold-resistant stress-induced stomach ulcers found that the methanol extract of L. camara leaves had antiulcerogenic action. Rats that were pre-treated with the extract (at 200 and 400 mg/kg body weight) shown a noteworthy protective effect against ulcers in rats that were produced by aspirin, ethanol, and cold restraint stress. In every animal, the extract exhibited dose-dependent antiulcerogenic efficacy.[42]

Hemolytic activity

Using a modified spectroscopic approach, the hemolytic activity of L. camara aqueous extract and its solvent fractions was assessed at four different concentrations (125, 250, 500, and 1000 µg/ml). Regarding human erythrocytes, the aqueous extract and its solvent fractions showed very little hemolytic activity.[43]

The following order of the various extracts' hemolytic activity was observed: Chloroform fraction > aqueous extract > ethanol fraction > methanol fraction > hexane and ethyl acetate fraction (50:50).[44]

Antihyperglycemic activity

In diabetic rats given alloxan, the methanol extract of L. camara leaves was shown to have antihyperglycemic effects. In alloxan-induced diabetic rats, oral treatment of the methanol extract of L. camara leaves (400 mg/kg body weight) led to a drop in blood glucose level to 121.94 mg/dl.[45]

Methanol extract of L. camara Linn fruits was tested for hypoglycemic effect in streptozotocin-induced diabetic mice (Wistar albino rats). In streptozotocin-induced diabetic rats, extract therapy at doses of 100 and 200 mg/kg body weight led to a dose-dependent drop in serum glucose levels. Improvements in body weight, HbA1c profile, and liver cell regeneration were also observed after extract administration.[46]

Wound healing activity

Rats were shown to benefit from the aqueous extract of L. camara leaves in terms of wound healing. When applied topically to the wound, the extract (100 mg/kg/day) greatly accelerated wound contraction (98%), sped up collagen synthesis, and shortened the healing period.[47]

An ethanol leaf extract from L. camara was found to have wound-healing properties in adult male Wister rats. When the extract was applied topically to the wound, it dramatically accelerated the healing process. The function of extract in healing was validated by histological examinations of cured lesions.[48]

Antimotility activity

It has been observed that L. camara leaf methanol extract has antimotility action in mice. The charcoal meal test was used to measure intestinal motility in mice. In normal mice, the extract totally prevented charcoal transit at a dose of 1 g/kg body weight. When mice were given castor oil-induced diarrhoea, the amount of faeces produced was dramatically decreased by the intraperitoneal administration of extracts at doses of 125 and 250 mg/kg body weight.[49]

Mosquito controlling activity

Anopheles culicifacies, Aedes aegypti, Culex quinquefasciatus, Anopheles fluvialitis, and Anopheles stephensi mosquitoes were found to be susceptible to the adulticidal activity of the essential oil derived from L. camara leaves. The LD50 values of the oil against these mosquitoes were 0.06, 0.05, 0.05, 0.05, and 0.06 mg/cm(2), while the LD90 values were 0.10, 0.10, 0.09, 0.09, and 0.10 mg/cm(2) against Aedes aegypti, Cx. quinquefasciatus, An. culicifacies, An. fluvialitis, and An. stephensi, respectively.[50]

Methanol and ethanol extracts of L. camara's leaves and flowers have been shown to have larvicidal effects on Ae. aegypti and Cx. quinquefasciatus mosquito larvae in their third and fourth instars. Significant larvicidal activity was shown by both extracts against the two species of mosquitoes; however, at low doses (1 mg/ml), the extracts were more effective against Ae. aegypti than against Cx. quinquefasciatus.[51]

Antifilarial activity

The crude extract of the stem of L. camara was found to have antifilerial action. In the rodent model of Mastomys coucha, the extract and its chloroform fraction killed adult Brugia malayi and sterilised the majority of the surviving female worms.[52]

Antiinflammatory activity

It was observed that L. camara's aqueous extract has anti-inflammatory effects on albino rats. In rats, the carrageenan-induced paw oedema test showed a substantial reduction in paw volume following extract treatment (500 mg/kg body weight).[53]

Anti fertility activity (Embryo toxicity)

In female albino Wistar rats, the effects of a hydroalcoholic extract of L. camara leaves were investigated with respect to teratology, overall reproductive function, and fertility. The extract affected the number of foetal skeletal abnormalities found in the study.

J. Pharm. and Tech. 5(6): June 2012 714 dams treated with the extract showed no symptoms of maternal toxicity, but instead produced embryotoxicity as evidenced by post-implantation loss.[54]

Antiurolithiatic activity

In male albino rats, ethylene glycol and ammonium chloride-induced calcium oxalate urolithiasis was shown to be inhibited by an ethanolic extract of L. camara leaves. The application of extract treatment markedly decreased calcium and oxalate deposition as well as calcium, oxalate, and creatinine excretion in the urine.[55]

Anticancer and Antiproliferative activity

The anticancer activity of oleanonic acid extracted from L. camara was tested against three human cancer cell lines, namely A375 (malignant skin melanoma), Hep2 (epidermoid laryngeal carcinoma), and U937 (lymphoma), as well as a mouse tumour (Ehrlich ascites carcinoma). Oleanonic acid demonstrated a positive cytotoxic effect on A375 cells.

It has been found that L. camara leaves have a cytotoxic impact on the Vero cell line. Using the MTT assay, an in vitro cytotoxicity test was conducted. The concentration of 500 µg/ml of methanol extract inhibited cell growth 2.5 times less than that of Triton 100 × 1%. It has been observed that L. camara leaves have antiproliferative action against the cell lines HEp-2 (laryngeal cancer) and NCI-H292 (lung cancer). Using the MTT assay, an in vitro antiproliferative test was conducted. L. camara leaf methanol extract demonstrated antiproliferative efficacy against NCI-H292.[56]

Anti mutagenic activity

Antimutagenic activity was demonstrated by 22β-acetoxylantic acid and 22β-dimethylacryloyloxy lantanolic acid derived from L. camara. Swiss mice were used in the micronucleus test for the antimutagenicity. When Mitomycin C was used to induce mutagenesis in mice, both substances showed strong antimutagenic effect.[57]

Antioxidant activity

Significant antioxidant activity was demonstrated by the ethanolic extract of L. camara in in vivo experiments. The amount of lipid peroxidation in the kidneys of urolithic rats was reduced by the extract therapy. The DPPH radical scavenging assay and the Nitric oxide free radical scavenging assay were used in the in vitro investigations.

The extract demonstrated strong antioxidant qualities in both tests. 35 By using the 1, 1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging assay and reducing power activity, the antioxidant activity of L. camara's leaves was reported. The antioxidant effect of leaf extracts was substantial; however, the antioxidant activity of younger leaves was stronger than that of older or more mature leaves.[58]

Patent

Marketed product

Product name:- ALVIA, Lantana oil (Essential oil)

Discription

The yellow liquid Lantana Camara Essential Oil has a spicy scent. It possesses a number of antibacterial, antiviral, antispasmodic, and antiseptic qualities. The oil shows promise in the management of tumours, cysts, and other conditions.

Botanical name:- Lantana camara

Origin:- India

Mode of extraction:- Steam Distillstion

Appearance:- The oil of yellow, with a pungent smell.

Solubility:- Insoluble in water, and soluble inalcohol and other organic solvents.

Blends with:- Bergamot, Rosemary, clove bud, Eucalyptus Globulus, etc.

Extraction method:- It is extracted by steam distillation method.

Essential oil information:- Lantana oil is extracted form the steam distillation method of the leaves of Lantana camara.

Constituents:- α-humulene, β-caryophyllene, ermacrene D, davanone, γ-curcumene, etc.

Summary

Uses for lantana essential oil include massage and skincare. It can be used in massage after being diluted with carrier oils. By adding lantana oil to your daily regimen, you may be able to preserve the health and beauty of your skin and hair, keeping them shiny and colourful.

Precautions:- This oil is non – toxic and non irritant as well as non- sensitizing. Our Essential/carrier oils are 100% natural and pure (undiluted/uncut) therapeutic grade.

Uses

- Anti-inflammation agent
- Have anti-microbial properties
- Fast healing property
- Have amazing respiratory effects
- Calm the patient during excess stress
- Aromatherapy application
- Has antispasmodic property
- Helps in treating chronic bronchitis, and many more

Benefits

- Has Antibacterial & Antifungal properties
- Can be used as a mosquito repellent
- Prevents skin itching & acne
- Relleves pain & muscles soreness
- Protects skin against free radicals

Brand promises

- 100% pure and natural
- Preservatives free
- No additives
- Eci friendly ingredients
- Steam distillation Extraction
- Responsibly sourced

Toxicology

Possibly in the top 10 most dangerous plants currently known, L. camara is one of them. There have been reports of L. camara toxicity from America, Australia, India, New Zealand, and South Africa. However, toxicity only manifests itself when a significant quantity of plant material is consumed. Horses, rats, neonatal calves, and lambs are not vulnerable to lantadene A, while sheep, cattle, and goats are said to be susceptible to lantadenes A, B, D, and icterogenic acid poisoning. The two most common clinical indicators of poisoning are jaundice and photosensitization.

Animals that have been poisoned experience a 24-hour period of decreased hunger as well as loss of appetite. Although most animals that are poisoned die within two days of the poisoning, most animals die one to three weeks later. The gall bladder is noticeably enlarged, the liver is enlarged, and the kidneys are bloated and pale in colour. For sheep, lantadene A has a hazardous oral dose of 60 mg/kg and an intravenous dose of 1-3 mg/kg.[59]

CONCLUSION

Scientific and encyclopaedic accounts of L. camara's therapeutic qualities portray it as a beneficial plant and indicate that it could be a potential target for future drug development.

REFERENCES

1. Munir A "A taxonomic review of Lantana camara L. and L. montevidensis (Spreng.) Briq. (Verbenaceae) in Australia". Journal of the Adelaide Botanic Gardens, 1996; 17: 1–27. "NatureServe Explorer".
2. "Lantana aculeta L." U.S National Plant Germplasm System (NPGS). Retrieved January, 6: 2019.
3. "Global Invasive Species Database". issg.org.uk. Archived from the original on, 2014-04-07. Retrieved 2014-03-22.
4. Floridata LC (2007). "Lantana camara". Floridata LC. Retrieved March, 24: 2014.
5. Moyhill Publishing (2007). "English vs. Latin Names". Moyhill Publishing. Retrieved March, 24: 2014.
6. Day, M. D. (December 24, 2003). Lantana: current management status and future prospects. Australian Centre for International Agricultural Research. ISBN 978-1-86320-375-3. Retrieved March 24, 2014.
7. Ghisalberti, E.L. "Lantana camara L. (Verbenaceae)". Fitoterapia, 2000; 71(5): 467–486. doi:10.1016/S0367-326X(00)00202-1. PMID 11449493.

8. Sharma, OM.P.; Harinder, Paul S. "A review of the noxious plant Lantana camara". Toxicon, 1988; 26(11): 975–987. doi:10.1016/0041-0101(88)90196-1. PMID 3072688
9. Randrianalijaona, J.A.; Ramanoelina, P.A.; Rasoarahona, J.R.; Gaydou, E.M. Seasonal and chemotype influences on the chemical composition of Lantana camara L.: Essential oils from Madagascar. Analytica Chimica Acta, 2005; 545: 46–52, https://doi.org/10.1016/j.aca.2005.04.028
10. Khan, M.; Mahmood, A.; Alkhathlan, H.Z. Characterization of leaves and flowers volatile constituents of Lantana camara growing in central region of Saudi Arabia. Arabian Journal of Chemistry, 2016; 9: 764–774. https://doi.org/10.1016/j.arabjc.2015.11.005.
11. Sousa, E.O.; Rocha, J.B.; Barros, L.M.; Barros, A.R.; Costa, J.G. Phytochemical characterization and in vitro antioxidant properties of Lantana camara L. and Lantana montevidensis Briq. Industrial crops and products, 2013; 43: 517–522, https://doi.org/10.1016/j.indcrop.2012.07.058.
12. Bashir, S.; Jabeen, K.; Iqbal, S.; Javed, S.; Naeem, A. Lantana camara: Phytochemical Analysis and Antifungal Prospective. Planta Daninha, 2019; 37, https://doi.org/10.1590/s0100-83582019370100137.
13. Verma, R.K.; Verma, S.K. Phytochemical and termiticidal study of Lantana camara var. aculeata leaves. Fitoterapia, 2006; 77: 466–468, https://doi.org/10.1016/j.fitote.2006.05.014.
14. Banik, R.M.; Pandey, D.K. Optimizing conditions for oleanolic acid extraction from Lantana camara roots using response surface methodology. Industrial crops and products, 2008; 27: 241–248, https://doi.org/10.1016/j.indcrop.2007.09.004.
15. Verma, S.C.; Jain, C.L.; Nigam, S.; Padhi, M.M. Rapid extraction, isolation, and quantification of oleanolic acid from Lantana camara L. Roots using microwave and HPLC-PDA techniques. Acta Chromatographica, 2013; 25: 181–199, https://doi.org/10.1556/achrom.25.2013.1.12.
16. Quentin C. B. Cronk, Janice L. Fuller (1995). Plant Invaders: The Threat to Natural Ecosystems. Royal Botanic Gardens, Kew: Springer. ISBN 978-0-412-48380-6.
17. Gentle, C. B. "Lantana camara L. invasions in dry rainforest - open forest ecotones: The role of disturbances associated with fire and cattle grazing". Australian Journal of Ecology, 1974; 22(3): 298–306.
18. Fensham, R. J; Fairfax, R. J; Cannell, R. J. "The invasion of Lantana camara L. in Forty Mile Scrub National Park, north Queensland". Austral Ecology, 1994; 19(3): 297–305.

19. Global Invasive Species Database". issg.org.uk. Archived from the original on 2014-04-07. Retrieved, 2014-03-22.
20. Plants Profile for Lantana camara (lantana)". plants.usda.gov. Retrieved, 2021-03-09.
21. Lowe S.; Browne M.; Boudjelas S.; De Poorter M. (2000). "100 of the World's Worst Invasive Alien Species. A selection from the Global Invasive Species Database" (PDF). The Invasive Species Specialist Group (ISSG). Retrieved 28 March, 2022.
22. Berry, Z C; Wevill, K; Curran, T J "The invasive weed Lantana camara increases fire risk in dry rainforest by altering fuel beds". Weed Research, 2011; 51(5): 525–533.
23. Okoth J. O. "A study of the resting sites of Glossina fuscipes fuscipes (Newstead) in relation to Lantana camara thickets and coffee and banana plantations in the sleeping sickness epidemic focus, Busoga, Uganda". Uganda Trypanosomiasis Research Organization, 1987; 8: 57–60.
24. "Effect of weeds Lantana camara and Chromelina odorata growth on the species diversity, regeneration and stem density of tree and shrub layer in BRT sanctuary" (PDF).
25. "Weed Management Guide – Lantana" (PDF). Retrieved March, 2014; 24.
26. Begum, S., Wahab, A., Siddiqui, B.S. Pentacyclic triterpenoids from the aerial parts of Lantana camara. Chem. Pharm. Bul, 2000; 51: 134-137.
27. Bhatt, N., Gupta, P.K., Naithani, S. Ceric-induced grafting of Acrylonitrile onto Alpha Cellulose isolated from Lantana camara. Cell. Chem. Techn, 2011; 45: 321-327.
28. Bhatt, Y.D., Rawat, Y.S., Singh, S.P. Changes in ecosystem functioning after replacement of forest by Lantana shrubland in Kumaon Himalaya. Jour. Veg. Sci, 1994; 5: 67–70.
29. Chopra, R.N., Nayar, S.L., Chopra, I.C. Glossary of Indian medicinal plants. CSIR New Delhi, India, 1956.
30. Day, M.D., Wiley, C.J., Playford, J.J., Zalucki, M.P. Lantana: Current Management, Status and Future Prospects. Aust. Cen. Inter. Agri. Res, 2003; 5: 1- 20.
31. Ganjewala, D.D., Sam, S., Khan, K.H. Biochemical compositions and antibacterial activities of Lantana camara plants with yellow, lavender, red and white flowers. Eur.Jour. Bio, 2009; 3: 69-77.
32. Kensa, V.M. Studies on phytochemical screening and antibacterial activities of Lantana camara Linn. Pl. Sci. Fe, 2011; 1: 74-79.
33. Kalita, S. Phytochemical composition and in vitro hemolytic activity of Lantana camara L. (Verbenaceae) leaves. Pharmacologyonline, 2011; 1(7): 59-67.
34. Prasad, A.M., Iverson, L.R., Liaw, A. Newer classification and regression techniques: bagging and random forests for ecological prediction. Eco, 2003; 9: 181–199.

35. Sharma, S., Singh, A., Sharma, O.P. An improved procedure for isolation and purification of lantadene A, the bioactive pentacyclic triterpenoid from Lantana camara leaves. Jour. Medi. Aro. Pla. Sci, 1999; 21: 686–688.
36. Thakur, M.L., Ahmad, M., Thakur, R.K. Lantana weed (Lantana camara var. aculeata Linn) and its possible management through natural insect pests in India. Ind. Fors, 1992; 118: 466–488.
37. Ganjewala D, Sam S and Khan KH. Biochemical compositions and antibacterial activities of Lantana camara plants with yellow, lavender, red and white flowers. EurAsian Journal of BioSciences, 2009; 3: 69-77.
38. Barreto FS et al. Antibacterial activity of Lantana camara Linn and Lantana montevidensis Brig extracts from Cariri-Ceará, Brazil. Journal of Young Pharmacists, 2010; 2(1): 42-44.
39. Badakhshan MP et al. A comparative study: antimicrobial activity of methanol extracts of Lantana camara various parts. Pharmacognosy Research, 2009; 1(6): 348-351.
40. Srivastava D, Singh P. Antifungal potential of two common weeds against plant pathogenic fungi- Alternaria sps. Asian Journal of Experimental Biological Sciences, 2011; 2(3): 525-528.
41. Tripathi S et al. Potential of Lantana camara Linn. Weed against wood destroying fungi. Indian Forest, 2009; 135(3): 403-411.
42. Thamotharan G et al. Antiulcerogenic effects of Lantana camara Linn. leaves On in vivo test models in rats. Asian Journal of Pharmaceutical and Clinical Research, 2010; 3(3): 57-60.
43. Ganesh T et al. Pharmacognostic and anti-hyperglycemic evaluation of Lantana camara (L.) var. aculeate leaves in alloxan-induced hyperglycemic rats. International Journal of Research in Pharmceutical Sciences, 2010; 1(3): 247-252.
44. Venkatachalam T et al. Antidiabetic activity of Lantana camara Linn fruits in normal and streptozotocin-induced diabetic rats. Journal of Pharmacy Research, 2011; 4(5): 1550-1552.
45. Nayak BS et al. Evaluation of wound healing activity of Lantana camara L. - a preclinical study. Phytotherapy Research, 2009; 23(2): 241-245.
46. Abdulla MA et al. Acceleration of Wound Healing Potential by Lantana camara Leaf Extract in Experimental Rats. Re s e arc h Jo u r nal o f Me dic a l Sc i e nce s, 3(2), 2 009: 75 -79.

47. Sagar L, Sehgal R and Ojha S. Evaluation of antimotility effect of Lantana camara L. var. acuelata constituents on neostigmine induced gastrointestinal transit in mice. BMC Complementary and Alternative Medicine, 2005; 5: 18.
48. Dua VK, Pandey AC and Dash AP. Adulticidal activity of essential oil of Lantana camara leaves against mosquitoes. Indian Journal of Medical Research, 2010; 131: 434-439.
49. Kumar MS, Maneemegalai S. Evaluation of Larvicidal Effect of Lantana Camara Linn. against mosquito species Aedes aegypti and Culex quinquefasciatus. Advances in Biology Research, 2008; 2(3-4): 39-43.
50. Misra N et al. Chemical constituents and antifilarial activity of Lantana camara against human lymphatic filariid Brugia malayi and rodent filariid Acanthocheilonema viteae maintained in rodent hosts. Parasitology Research, 2006; 100(3): 439-448.
51. Gidwani BK et al. Analgesic, anti-inflammatory and anti-hemorrhoidal activity of aqueous extract of Lantana Camara Linn. Research Journal of Pharmacy and Technology, 2009; 2(2): 378-381.
52. De Mello FB et al. Effects of Lantana camara (Verbenaceae) on rat fertility. Veterinary and Human Toxicology, 2003; 45(1): 20-23.
53. Mayee R, Thosar A, Evaluation of Lantana camara Linn. (Verbenaceae) for antiurolithiatic and antioxidant activities in rats. International Journal of Pharmaceutical and Clinical Research, 2011; 3(1): 10-14.
54. Ghosh S, Das Sarma M, Anti-inflammatory and anticancer compounds isolated from Ventilago madraspatana Gaertn., Rubia cordifolia Linn. and Lantana camara Linn. Journal of Pharmacy and Pharmacology, 2010; 62(9): 1158-1166.
55. Pour BM, Latha LY and Sasidharan S. Cytotoxicity and oral acute toxicity studies of Lantana camara leaf extract. Molecules, 2011; 16(5): 3663-3674.
56. Gomes de Melo J et al. Antiproliferative activity, antioxidant capacity and tannin content in plants of semi-arid Brazil. Molecules, 2010; 15(12): 8534-42.
57. Barre JT et al. A bioactive triterpene from Lantana camara. Phytochemistry, 1997; 45(2): 321-324.
58. Sharma OP et al. A review of the toxicity of Lantana camara (Linn) in animals. Clinical Toxicology, 1981; 18(9): 1077-1094.
59. Sharma OP, Makkar HPS and Dawra RK. A review of the noxious plant Lantana camara. Toxicon, 1988; 26(11): 975-987.