Biospectra : ISSN: 0973-7057, Vol. 18(1), March, 2023, pp. 165-170

An International Biannual Refereed Journal of Life Sciences

Plant Science

ISSN : 0973-7057

A comprehensive review on various uses of *Lantana camara* L.

Shweta Bhodiwal[a]*, Reenu Agarwal[a] & Sunita Chauhan[b]

[a]Department of Botany, IIS (Deemed to be University), Jaipur, Rajasthan, India

[b]Kumarappa National Handmade Paper Institute, Pratap Nagar, Jaipur,Rajasthan, India

Received : 23rd November, 2022 ; Revised : 24th December, 2022

Abstract- *Lantana camara* is more famous as poisonous weed instead of medicinal plant in the majority of the nations. The camara plant can propagate even in the outrageous extreme climate of tropical as well as sub-tropical areas and thus get naturalized overall as a decorative plant counting India. Steroid, flavonoids, saponins, alkaloids, triterpenoids and tannins are some phytochemicals that are identified from the *L. camara* L. Besides, this plant is also its contribution in the form of oil- generating plants, and the accessible fundamental oil available in the market is known by the name of *Lantana* oil. However it also shows its properties in treating variety of diseases viz. bronchitis, stomach pain, gastrointestinal diseases, etc. The natural resources are misused and have drawn nearer to the edges of earth's capability. Mill made paper's life cycle really damages the atmosphere from beginning and lasts for the end. Thus this study highlights that how an alternative eco-safe material and method can help in the production of handmade paper. The key purpose is to emphasize the potential of invasive plants and weeds those makes the negative effect on the other side by crops. Thus, these weeds are used as non-wood raw material for paper production.

Key words: Medicinal, Poisonous, Ornamental, Disease, Invasive plant, Natural Resources, Handmade paper.

INTRODUCTION

Northern European (Sweden, Finland, and North-West Russia), North American (Canada and United States), and the East Asian nations (such as China, South Korea, East Siberian Russia and Japan) has the major dominance on the pulp and paper production. China is the world's leading producer of paper followed by the United States.[1] In India, the paper industry is a combination of small, medium and large mills. Paper industry in India is the largest industry and stood on twentieth position among the world's paper producing industry.[2] According to the Indian Paper Manufacturers Association (IPMA) in 2009. From the total world's production of paper and paper board, the Indian paper industry represents around 1.6%.

*Corresponding author :
Phone : 7742313441
E-mail : shwetabhodiwal.20@gmail.com

A paper is shaped when wet cellulose filaments got from different sources are squeezed and pressed together and dried into thin, adaptable sheets. This versatile material has various purposes such as for recording as a hard copy, cleaning, bundling, and printing and also in various modern industrial and development processes. As demonstrated by the report on Ecology Global Network, the use of paper has become over 400% in the beyond 40 years worldwide. As of now, in each continent, the pulp and paper industries utilize just about 4 billion trees or 35% of the total trees cut all through the world. Thus, to reduce or to prevent the rate of deforestation there is a strong need of non-woody raw materials. Also, in the nations with lacking forest resources; the need to find non-wood plant fibres, seems appropriate for papermaking and is realized more strongly. Likewise, global warming and limitations on carbon

dioxide discharges increases gradually due to wood cutting and this creates the troublesome to the environment.[3] Generally, paper can be described as the extraction of cellulose from the plant materials whose quality normally depends upon fineness and brilliance of the fibers. A variety of synthetic fibers, such as Polyethylene and Polypropylene can be incorporated into the paper to find the desirable physical properties as the fibers are commonly sourced naturally by origin. For paper making the most commonly and recognized source of the natural fiber is considered as wood pulp from pulpwood trees.[4-6]

According to various studies – an invasive alien species is those which spreads beyond its zone of distribution.[7-9] Invasive species are considered as either native or is non-native species that can intensely colonize a specific living habitat.[10] They are likewise generally dispersed in a wide range of biological systems all through the globe. Invasive alien species have the capability to make themselves, invade, adapt and compete natives and also make dominance at the new environment in few weeks only.[11] Invasive weeds are presently influencing each and every ecosystem types in the world and they are the second most noteworthy global threat to the biodiversity after habitat destruction.[9,12] IAS competes the native species for resources such as - breeding sites and food indirectly by changing habitat and adjusts nutrient cycling, hydrology and other ecosystem processes. Their effects are on local biodiversity in ecosystem like farming and range lands, national parks, streams, lakes, waterways, power dams, street sides and metropolitan green spaces with immense economical as well as social consequences. This drastically change the ecosystem in both positively and negatively ways.[13-15]

This plant species belongs to the family Verbenaceae and order Lamiales as shown in figure 1. *Lantana* is a genus of about 150 species of perennial flowering plants.[16] *L. camara* species was first represented and acknowledged its binomial name by Linnaeus in 1753.[17] *L. camara* grows in tropical, subtropical, and mild areas at the height of up to 2000 m.[18] *Lantana camara* is sometimes also known as "Red (Yellow, Wild) Sage", despite of its classification that belongs to family sage (Lamiaceae), and order sagebrush (Asterales).[19]

Lantana camara grows in diverse habitats and on the various types of soils. *Lantana* mostly grows supreme in open, un-shaded conditions such as wildernesses, edges of the rain forests, beachfronts, scrub/shrub lands, urban areas, agricultural areas, grasslands, riparian zones and forests that are at the age of recovery from logging or fire.[19] It grows up to 3 m of height. In Himachal Pradesh, Uttar Pradesh, Uttarakhand, Maharashtra, Madhya Pradesh, and north-eastern States of India, this weed species has its wide dominance.[20] The life cycle of *L.camara* is shown in Figure. 2.

Fig.1. *Lantana camara.*

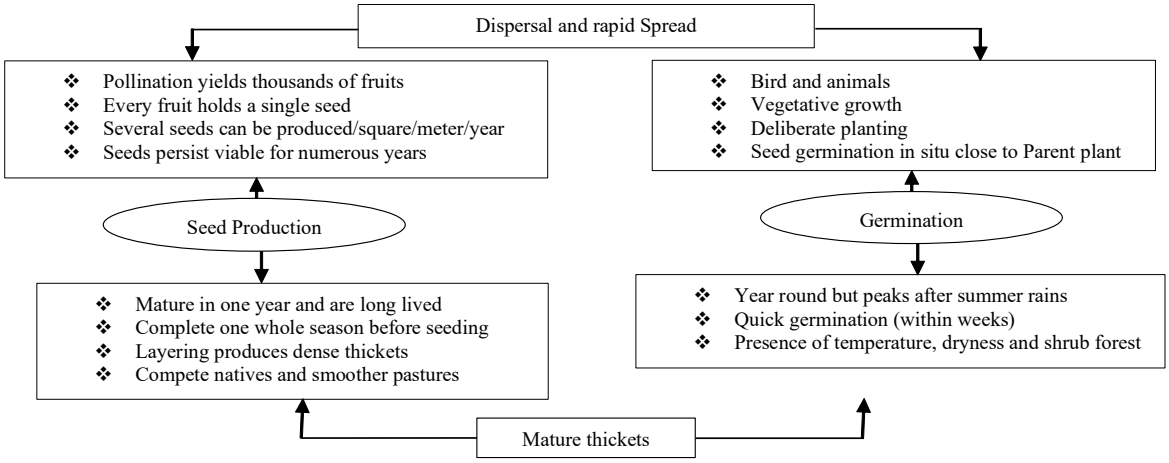

Fig. 2- Life cycle of *Lantana camara*

Pharmacology of *Lantana camara*

An amazing number of modern drugs have been isolated from natural sources.[19] The leaves' infusion of *Lantana camara* are utilized to treat gastrointestinal sicknesses, as emmenagogue, diuretic, expectorant and antirheumatic[21] to treat wounds[22] and is used as a tonic for stomach torments as it can be used as an insecticide.[23] *Lantana camara* plant has been accounted for to have various pharmacological properties as like antipyretic, antithrombin, hostile to inflammatory, antimicrobial, antimutagenic, antitumor, inhibitors of the enzymes acetylcholinesterase furthermore, antinoceptive.[21,24-27] *L.camara* has helpful potential due to different bioactive components, including steroids – lancamarone, triterpenoids, oligosaccharides, iridoid glycosides, naphthoquinones, and phenylpropanoid glycosides.[28]

The leaf extricates were found to have most of compound constituents including Triterpenoids, alkaloids, flavonoids, tannins, saponins, glycosides.[28-30] In stem and fruit- tannins, saponins, flavonoids, and terpenoids are reported.[30] Root of the plant has significant bioactive compound i.e., 'Oleanolic acid'.[31] From different parts of the *Lantana camara v*arious compounds are obtained which are presented in Table 1.[32]

Table 1- Parts of *Lantana camara* with their useful compounds

Sl. No.	Part	Compounds	Action
1.	Leaves and stem	Oleanonic acid	Anti-inflammatory
2.	Leaves	Lactones comprising euphanes	Anti-thrombin
3.	Aerial parts	Lantanoside and Camarinic acid	Nematicidal
4.	Roots, stem and leaves	Oleanonic acid	Antitumor, Antimicrobial, anti-inflammatory
5.	Leaves	Apigenin	Anti-proliferative
6.	Branches and leaves	Martynoside	Cardioactive
7.	Leaves	Camaraside	Anti-tumour

Toxicity

Lantana camara is among the top ten invasive weeds and noxious plant present on the earth, thus, this plant is considered as a poisonous plant.[19] *Lantana camara* L., is generally the weed of Central and South American origin and has a gigantic effect to the native composition of the terrestrial ecosystem.[20,33] In India some regions including pasture fallow land, farm, and forest elements, etc., has its unpredictable very random spread and existence.[34-36]

Its attack is involved in broad loss of local species variety by means of limitation, competition, recruitment, and alteration to the structure and function of ecosystem.[33,37,38] According to the World Conservation Union, after the habitat destruction invasive species are typically considered as the second utmost prominent threat to the biodiversity.[39,40] In their new ecosystems, these become predators, parasites, competitors, hybridizers, and causes disease to the native and domesticated plants and animals.[33,41] In its foliage Lantadenes are present which has harmful and toxic pentacyclic triterpenoids. Hepatotoxicity and photosensitivity are caused in some grazing animals such as goat, sheep, horses and bovines by Lantadene A and B.[19,42] If cattle feed these plant parts, then it can cause pink muzzle, nose disease and jaundice.[43]

Lantana camara* as a papermaking material*:

Handmade paper making is the art of tradition that has been experienced from generations together by a specific class of society. The knowledge of this art transfers from generations to generations. These craft persons are generally known by the name of "Kagzi's".[44] The traditional forest based raw materials viz. wood and bamboo can be replaced by potential non wood sustainable raw material. A very few reports available in literature who have illustrated that *Lantana camara* has the potential to be used as a raw material in for making paper. Hence, for the sustainable management of *Lantana camara* it is essential to flourish a management framework keeping in purview advantages as well as limitations of various control strategies.[45]

From the studied sample, it was seen that the combination of *Lantana camara* and rice straw have yielded the pulp and paper of superior or greater quality.

Fibre characteristics of *Lantana camara* was done for analysis the pulp and paper making. The following derived values of fibre: coefficient flexibility, Runkel ratio and fineness ratio of the *Lantana* species was considered as very significant source for making paper, thus it can be used as a potential substitute in the papermaking industries especially for *Gmelina arborea* or other species.[4]

The results of proximate chemical analysis reflected the suitability of *L. camara* for paper making. Plant material of *L. camara* contains 66.06% holocellulose and 26.93% lignin. The pentosan was found to be 13.69% and solubility in hot water recorded as 7.25% and alcohol benzene ratio was 5.10%. For the assessment of soundness of wood for decay 1% NaOH solubility test is performed. In future for further researches the value that ranges in between 10-30% is usually considered as suitable. 1% NaOH solubility test recorded in this study was 18.75% and the ash content was 2.30%**.** It shows its suitability in the form of raw material for making the pulp and paper. The values of anatomical studies of *L. camara* observed 684 minimum, 1134.20 maximum, 912 as average. Fibre diameter contains 22, lumen diameter is 10. Wall thickness is 3.06, runkel ration has 0.43, and length/width has 0.68 and Shape factor is 0.36. This record shows that lantana has shorter fibre length. The smaller the fibres, the uniform and more perfect will be the paper or sheet formation.

Soda, soda sulphite, and Kraft pulping had been reported to be performed in stainless steel digester in an electrically heated along with regulator- controlled system. With the help of C-Ep-H-H sequence unbleached pulps are made bleached**.** Bleached pulp yield was recorded maximum (45.6%) at 12% chlorine demand with 81.6% brightness. In case of soda – sulphite and Kraft process bleached pulp yield was 44.5 and 46.2% with brightness 82.5% and 73.5%. The physical strength properties of bleached pulps express that initial freeness was maximum (26 OSR) in case of pulp recorded by the sulphite process while minimum (22 OSR) in case of pulp recorded with 18% NaOH. As compared to the soda and sulphite bleached pulp, bleached kraft pulp possess higher strength properties. Each pulp possessed sufficient strength properties and thus can be utilized for the production of varieties of paper and products. According to a report it has been observed that *Lantana camara* possess hollo-cellulose - 75.03%, Alcohol benzene Extractive- 8.461%, lignin- 18.21% and silica- 2.31% which shows the satisfactory potential as a raw material for making paper. However, there is a justified need to conduct a detailed study from the specific point of view in utilization of specific processing techniques in the field of handmade papermaking.

Through consideration of the above mentioned, the ongoing review is being proposed to evaluate the complete potential of the plant for making handmade paper sheets in ecofriendly manner so as develop a simple and cost-effective method of the sustainable management of the common weed plant and invasive plant species of *Lantana camara.*

CONCLUSION

The business of paper completely depends on the forest. Mill paper industry uses the forest- based woody raw material due to which not only the deforestation but also the pollution problem increases. Natural resources start to diminish gradually and its capacity comes closer to the limits of earth. The complete life cycle of mill made paper actually harms the environment continuously from beginning till end. It just starts from the cutting of tree and ends with the emission of toxic chemicals as like carbon dioxide, sulphur compounds and other harmful chemicals in the environment. Thus, mill sector makes the adverse effect on environment. For the production of pulp and paper it is required to discover the alternate technique and that can be the handmade paper.

Thus, this *Lantana camara* can be an option for the production of paper which will provide better opportunities for the management of weeds and by using these sources significant products can also be produced. One of the main advantages is that it is 100 % recycled and wood free. It is of potential economic value as it contains appreciable number of cellulosic fibres, have incredible strength properties. If such weeds cum agricultural wastes are managed in the proper manner, then it can benefit both farmers as well as the environment. Thus, only the utilization of these plant species can be the powerful strategy for dealing such weeds. Thus, environment can get rid of the adverse consequences of *Lantana camara* through this proper utilization approach and can also help in the nation's economic upliftment. Such weeds provide the opportunities to generate the employment along with the management of weed waste at the community level.

REFERENCES

1. **Mike S. D. 2013.** China's Paper Operation. Pulitzer Center on Crisis Reporting. Retrieved 13 April.
2. **Kesalkar V. P., Khedikar I. P. & Sudame A. M. 2012.** Physico-chemical characteristics of wastewater from paper industry. *Int. J. Eng. Res. Appl*, **2(4):** 137-143.
3. **Neelagar R., Yathish R., Srinivasa S., & Vasappa R. K. 2018.** Characterization of paper and pulp properties

from weed species. *J. of App. Bio.& Biot.* **6(06):**61-63.

4. **Ajuziogu G. C., Ojua E. O. & Aina D. O. 2019.** Comparative paper-making potentials of three species from the Verbenaceae and Lamiaceae family. *Asian Journal of Research in Botany*,. 1-5.

5. **Pokhrel D. & Viraraghavan T. 2004.** Treatment of pulp and paper mill wastewater—a review. *Science of the Total Environment*. **333(1-3):** 37-58.

6. **Iqbal H. M. N., Kyazze G. & Keshavarz T. 2013.** Advances in the valorization of lignocellulosic materials by biotechnology: an overview. *BioRe*. **8(2):**3157-3176.

7. **Shine C, Kettunen M, Ten Brink P. 2009.** Technical support to EU strategy on invasive species (IAS)– Recommendations on policy options to control the negative impacts of IAS on biodiversity in Europe and the EU. Final report for the European Commission. Brussels, Belgium.

8. **Ng'weno C. C., Mwasi S. M. & Kairu J. K. 2010.** Distribution, density and impact of invasive plants in Lake Nakuru National Park, Kenya. *African Journal of Ecology*. **48(4):** 905-913. https://doi.org/10.1111/j.1365-2028.2009.01191.x

9. **McNeely J. A., Mooney H. A. & Neville L. E. 2001.** Global Strategy on Invasive Alien Species. IUCN Gland, Switzerland, and Cambridge. *Collaboration with the Global Invasive Species Programme*.

10. **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 (Vol. 12). Auckland: Invasive Species Specialist Group.

11. **Crooks J. A. 2002.** Characterizing ecosystem level consequences of biological invasions: the role of ecosystem engineers. *Oikos*. **97(2):** 153-166.

12. **Esther M., & Brent S. 2005.** Invasion of *Prosopis juliflora* and local livelihoods: Case study from the Lake Baringo area of Kenya, ICRAF working paper no. 3, 66.

13. **Admasu D. 2008.** Invasive plants and food security: the case of Prosopis juliflora in the Afar region of Ethiopia. *FARM-Africa, IUCN*, 1-13.

14. **Neill A. 2005.** A Dictionary of Common Wildflowers of Texas and the Southern Great Plains. *Texas Christian University Press*.

15. **Ved A., Arsi T., Prakash O. & Gupta A. 2018.** A review on phytochemistry and pharmacological activity of *Lantana camara* Linn. *Int J Pharm Sci Res.*, **9(1):** 37-43.

16. **Ganjewala D., Sam S., & Khan K. H. 2009.** Biochemical compositions and antibacterial activities of *Lantana camara* plants with yellow, lavender, red and white flowers. *EurAsian J. of BioSci*. **3(1):** 69-77.

17. **Lonare M. K., Sharma M., Hajare S. W. & Borekar V. I. 2012.** *Lantana camara*: overview on toxic to potent medicinal properties. *International Journal of Pharmaceutical Sciences and Research*. **3(9):**3031.

18. **Gaur R. D. 1999.** *Flora of the District Garhwal, North West Himalaya*. Transmedia.

19. **Sharma O. P., Makkar H. P. S. & Dawra R. K. 1988.** A review of the noxious plant *Lantana camara*. *Toxicon*. **26(11):** 975-987.

20. **Priyanka N. & Joshi P. K. 2013.** A review of *Lantana camara* studies in India. *International Journal of Scientific and Research Publications*. **3(10):** 1-11.

21. **Uzcátegui B., Ávila D., Suárez-Roca H., Quintero L., Ortega J., & González B. 2004.** Anti-inflammatory, antinociceptive, and antipyretic effects of *Lantana trifolia* Linnaeus in experimental animals. *Investigacion Clinica*, **45(4):** 317-322.

22. **Zheng H., Wei N., Wang L., & He P. 2006.** Effects of *Lantana camara* Leaf Extract on the Activity of Superoxide Dismutase and Accumulation of H_2O_2 in Water Hyacinth Leaf. *Journal of Plant Physiology and Molecular Biology*, **32(2):** 189.

23. **Barbosa Filho J. M., Medeiros K. C. P., Diniz M. D. F. F., Batista L. M., Athayde-Filho P. F., Silva M. S. & Quintans-Júnior L. J. 2006.** Natural products inhibitors of the enzyme acetylcholinesterase. *Revista Brasileira de Farmacognosia*, **16:** 258-285.

24. **Misra N., Sharma M., Raj K., Dangi A., Srivastava S. & Misra-Bhattacharya S. 2007.** 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*. **100(3):** 439-448.

25. **Shah M., Alharby H. F., & Hakeem K. R. 2020.** *Lantana camara*: A Comprehensive Review on Phytochemistry, Ethnopharmacology and Essential Oil Composition. *Lett. Appl. NanoScience*, **9:** 1199-1207.
26. **Khan M., Mahmood A., & Alkhathlan H. Z. 2016.** Characterization of leaves and flowers volatile constituents of *Lantana camara* growing in central region of Saudi Arabia. *Arabian Journal of Chemistry*. **9(6):** 764-774.
27. **Bashi, S., Jabeen K., Iqbal S., Javed S. & Naeem A. 2019.** *Lantana camara*: Phytochemical analysis and antifungal prospective. *Planta Daninha*. **37**.
28. **Verma S. C., Jain C. L., Nigam S., & Padhi M. M. 2013.** Rapid extraction, isolation, and quantification of oleanolic acid from *Lantana camara* L. roots using microwave and HPLC-PDA techniques. *Acta Chromatographica*. **25(1):** 181-199.
29. **Lakshmi C. S. & Sekhar C. C. 2018.** Impact, management and uses of *Lantana camara*–A noxious weed. *Bull Env Pharmacol Life Sci*, **7:** 170-180.
30. **Lüi X. 2011.** Quantitative risk analysis and prediction of potential distribution areas of common lantana (*Lantana camara*) in China. *Computational Ecology and Software*, **1(1):** 60-65.
31. **Saha S. 2002.** Anthropogenic fire regime in a deciduous forest of central India. *Current Science*. 1144-1147.
32. **Batianoff G. N. & Butler D. W. 2003.** Impact assessment and analysis of sixty-six priority invasive weeds in south-east Queensland. *Plant Protection Quarterly*. **18(1):** 11-17.
33. **Yadav S. B. & Tripathi V. 2003.** A new triterpenoid from *Lantana camara*. *Fitoterapia*. **74(3):** 320-321.
34. **Kohli R. K., Batish D. R., Singh H. P. & Dogra K. S. 2006.** Status, invasiveness and environmental threats of three tropical American invasive weeds (*Parthenium hysterophorus* L., *Ageratum conyzoides* L., *Lantana camara* L.) in India. *Bio. Invasions*. **8(7):** 1501-1510.
35. **Dobhal P. K., Batish D. R. & Kohli R. K. 2009.** Phyto-sociological transformations in burnt *Lantana camara* L. Invaded communities in context of unburnt invaded and non-invaded plant communities. *Ecoscan*. **3:**41-45.
36. **De Miliano J. W., Woolnough A., Reeves A. & Shepherd D. 2010.** Ecologically significant invasive species, a monitoring framework for natural resource management groups in Western Australia. ISSN: 1833-7236
37. **Zhang W. & Chen B. 2011.** Environment patterns and influential factors of biological invasions: a worldwide survey. *Proceedings of the International Academy of Ecology and Environmental Sciences*. **1(1):** 1.
38. **Van Kleunen M., Dawson W., Schlaepfer D., Jeschke J. M. & Fischer M. 2010.** Are invaders different? A conceptual framework of comparative approaches for assessing determinants of invasiveness. *Ecology letters*. **13(8):** 947-958.
39. **Anderson L. W. 2005.** California's reaction to *Caulerpa taxifolia*: a model for invasive species rapid response. *Biological Invasions*. **7(6):** 1003-1016.
40. **Moore C. T. & Conroy M. J. 2006.** Optimal regeneration planning for old-growth forest: addressing scientific uncertainty in endangered species recovery through adaptive management. *Forest Science.* **52(2):** 155-172.
41. **Ray A. K., Puri M. K. 2006.** Modeling H Factor-Kappa Number for Kraft Pulping of *Lantana camara* Plant; An Experimental Investigation. *Advances in Bio Catalytics and Protein Enggineering.* **15:**1-62.
42. **Soni P. L., Naithani S., Gupta P. K., Bhatt A. & Khullar R. 2006.** Utilization of economic potential of *Lantana camara. Indian Forester*. **132(12):** 1625-1630.
43. **Naithani S. & Pande P. K. 2009.** Evaluation of *Lantana camara* Linn. stem for pulp and paper making. *Indian Forester*. **135(8):** 1081.
44. **Bhatt N., Gupta P. K. & Naithani S. 2011.** Hydroxypropyl cellulose from á-cellulose isolated from *Lantana camara* with respect to DS and rheological behavior. *Carbohydrate polymers*. **86(4):** 1519-1524.
45. **Pandita S., Kaula B. & Passey S. 2015.** Use of weeds and agro-based raw materials and their blends for handmade paper making. *J. Un. Res Innov*. **1:** 169-179.

***