IJPSR (2018), Vol. 9, Issue 1 (Review Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 01 May, 2017; received in revised form, 04 September, 2017; accepted, 21 October, 2017; published 01 January, 2018

A REVIEW ON PHYTOCHEMISTRY AND PHARMACOLOGICAL ACTIVITY OF *LANTANA CAMARA* LINN.

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Keywords:

Lantana camara, Verbenaceae, Phytochemistry, Pharmacological activity.

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ABSTRACT: *Lantana camara* Linn. is considered as a notorious weed and a popular ornamental plant. It is noted from ancient time that plants have been an excellent source of medicine. Since very long time *Lantana camara* has been reported as one of the most important medicinal plants in the world. *Lantana camara* is used in traditional medicine system for the treatment of cuts, swellings, ulcers, cataract, bilious fever, itches, eczema, and rheumatism. Various parts of *Lantana camara* plant are used in the treatment of cold, headache, whooping cough, asthma, chicken pox, bronchitis, eye injuries, and arterial hypertension. *L. camara* has scientifically studied for various therapeutic activities like antibacterial, antioxidant, antipyretic, insecticidal, antimicrobial, wound healing, *etc*. Nowadays this plant *Lantana camara* is worked in several recent advanced techniques like phyto-extraction of heavy metals, phytoremediation of particulate pollution and many others. Various literature has reported the phytoconstituents present in all parts of *Lantana camara*. In last few decades, scientist and researchers throughout the globe have elaborately examined the chemical composition of the whole plant of *L. camara*. The plant is spread widely over Uttarakhand, Uttar Pradesh, Himachal Pradesh, and North-Eastern states of India. The present review is an aim to give a complete report of the literature on its phytochemistry and pharmacological activity.

INTRODUCTION: *Lantana camara* Linn. relating to the family Verbenaceae, familiarized in India as a decorating plant but entirely naturalized and found throughout India [1]. *Lantana camara* has been standing as one of the most fundamental medicinal weeds in the world [2]. The word *Lantana camara* obtains from Latin 'lento' which means 'to bend' [3].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.9(1).37-43

Article can be accessed online on: www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.9(1).37-43

This species was first represented and acknowledged its binomial name by Linnaeus in 1753 [2]. The plant *Lantana camara*, commonly known as wild sage or red sage, is the plant of the genus of Verbenaceae family with 600 variations existing natural, and it is an arboreous plant with different flower colours *i.e*. red, white, yellow and violet.

It is an evergreen potent smelling shrub, and its leaves are opposite, simple with large petioles, oval blades which are rugged and hairy and have bluntly toothed margins [4]. Berries of *Lantana camara* are round, fleshy, two-seeded bean. In initially seeds of *Lantana camara* are green colour and turning purple and finally to a blue-black colour. *Lantana camara* is indigenous plant found in tropical

regions. *Lantana camara* is well-noted by several names in several languages in India *viz*. Kakke and Natahu (Kanada), Arippu and Unnichedi (Tamil), Aripoov, Poochedi, Konginipoo and Nattachedi (Malayalam), Thirei, Samballei, Chaturangi and Vanacehdi (Sanskrit), Nongballei (Manipuri), Raimuniya (Hindi), Tantani and Ghaneri (Marathi) and Pulikampa (Telegu) [5, 6].

Lantana camara is regularly used as herbal medicine and in some areas as firewood and mulch [7]. Especially in India, there has been to a great extent work conducted on the chemical constituents of *Lantana camara*. The leaf oil is employed as an antiseptic for scars; the roots are used for the treatment of a toothache and the flowers for chest complaints in children [8]. *Lantana camara* leaves extract exhibited anti-proliferative, antimicrobial, fungicidal, insecticidal and nematicidal activities [9 - 12]. *Lantana camara* shoots extract exhibited significant antioxidant activity [13].

The berries fruits are useful in fistula, pocks, tumors and rheumatism [14 - 17]. The essential oil of *Lantana camara* exposed a broad spectrum of antibacterial, antimicrobial, and antifungal activities [18 - 20]. In *Lantana camara*, chemical constituents are present as triterpenes like lantadenes A, B, C, and D **(Fig. 1- 4)** [21], alkaloids, flavonoids [22], saponins, tannins [23], germacrene A, B and D **(Fig. 5)** and chief compounds are valencene and γ- gurjunene [3].

FIG. 6: *LANTANA CAMARA* PLANT

Taxonomical Classification: [24]

Kingdom: Plantae
Subkingdom: Tracheobionta
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 [24, 25, 26].

Ayurvedic Description:
Sanskrit Name: Chaturangi, Vanacchedi

Properties: Rasa: Kashaya, Tikta; Guna; Guru; Virya: Sita

Therapeutic Uses: Plant pacifies vitiated condition of vata and kapha [27].

Growth and Distribution: *Lantana camara* is the most outspread species growing abundantly at altitudes up to 2000 m in tropical, subtropical and temperate regions. The species name (camara) is probably followed from the West Indian [3]. In its native range in tropical America, *Lantana camara* mainly endows in small clumps less than or equal to 1m in diameter [28]. In its naturalized range, *Lantana camara* usually forms dense monospecific thickets 1 - 4m high and approximately 1 - 4m in diameter [29]. *Lantana camara* has becoming naturalized in almost 60 countries [13].

The distribution of Lantana is still expanding with many countries and Islands that are Yap, Galapagos Islands, Palau, Saipan, Tinian, Solomon Islands and Futuna Islands [30]. At disordered areas such as roadsides, railway tracks, and canals are also favourable for the species [31]. It does not arise to have an upper temperature or rainfall limit [32]. *Lantana camara* can't come through under dense and intact canopies of taller native forest species, and *Lantana camara* is susceptible to frosts, low temperature, and saline soils [33].

Phytochemistry: *Lantana camara* has therapeutic activity due to the presence of natural agents, the greater part of their activity is due to bioactive compounds namely saponins, alkaloids, tannin, anthocyanins, flavones, isoflavones, flavonoids, coumarins, lignans, catechins, iso-catechins, and triterpenoids. Wollenweber *et al*., have identified and reported the presence of two triterpenoid esters namely, camarilic acid and camaricinic acid [34].

Silva *et al*., in 1999 discovered the chemical composition of essential oils collected from different regions. The chief constituents present in the oil of *Lantana camara* were α- phellandrene **(Fig. 7)**, germacrene-D **(Fig. 5)**, limonene, β-caryophyllene, sabinene **(Fig. 8)**, α-zingi- berene and α- humulene [35].

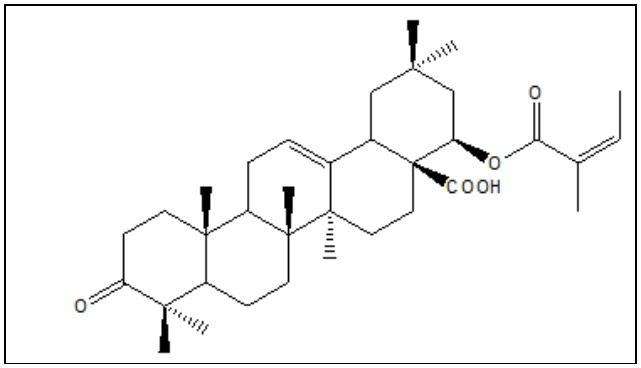

FIG. 1: LENTADENES A

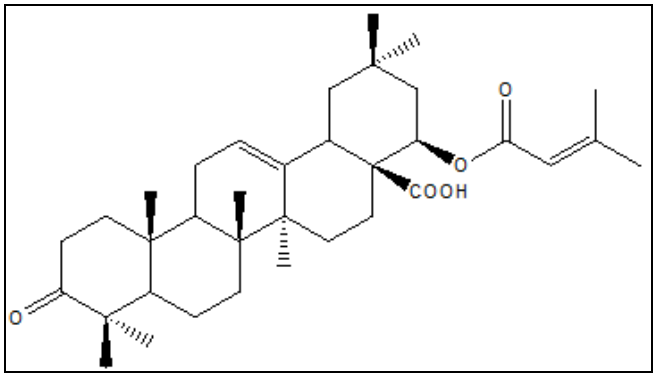

FIG. 2: LENTADENES B

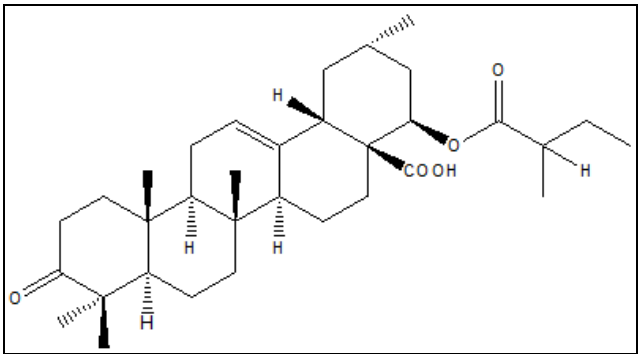

FIG. 3: LENTADENE C

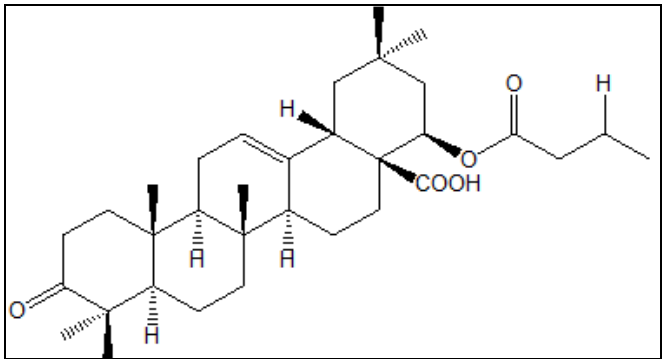

FIG. 4: LENTADENE D

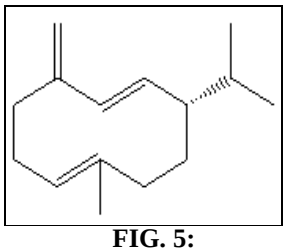

FIG. 5: GERMACRENE D

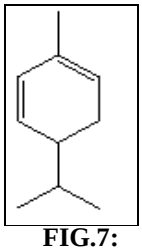

FIG.7: PHRLLA-NDRENE

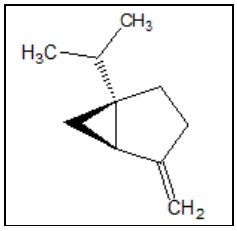

FIG. 8: SABINENE

Begum *et al*., in 2006 described presence of three new pentacyclic triterpenoids lantacin (=(3β,19 α,22 β)-3,19-dihydroxy-22-[(3-methylbut-2-enoyl) oxy]urs-12-en-28-oic acid) **(Fig. 9)**, camarin (=(7α) -7-hydroxy-3-oxoolean-12-en- 28-oic acid) **(Fig. 10)**, and camarinin (=(22β)-3β,25-epoxy-3-hydroxy - 22- [(3-methylbut-2-enoyl)oxy]-11-oxoolean-12-en-28-oic acid) **(Fig. 11)** in aerial parts of *Lantana camara* [36].

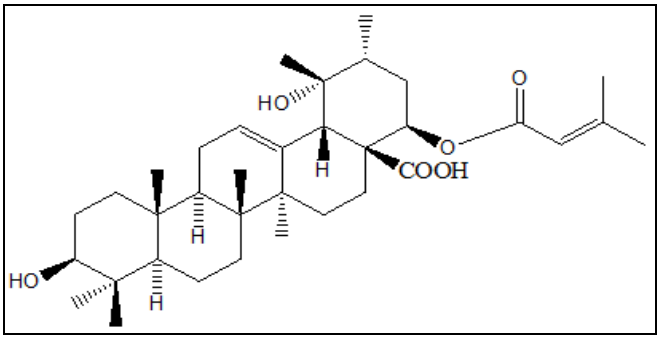

FIG. 9: LANTACIN

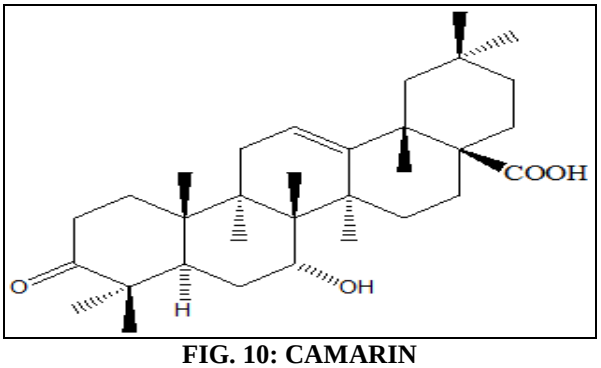

FIG. 10: CAMARIN

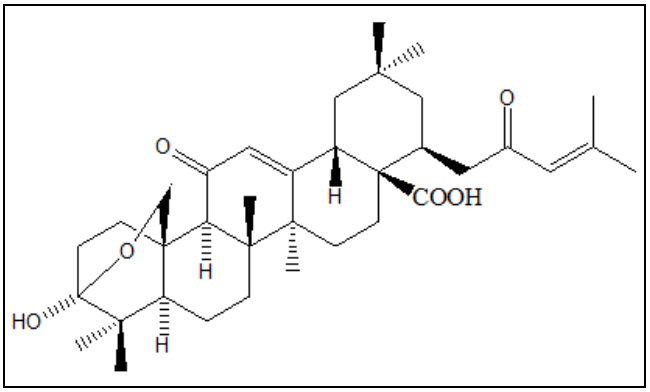

FIG. 11: CAMARININ

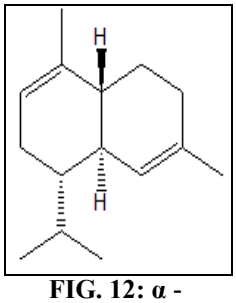

FIG. 12: α - CADINENE

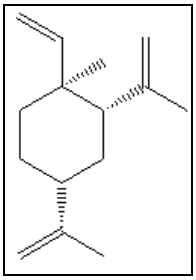

FIG. 13: β - ELEMENE

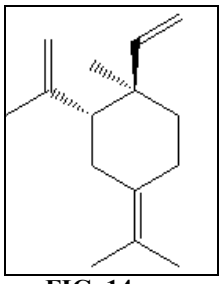

FIG. 14: γ - ELEMENE

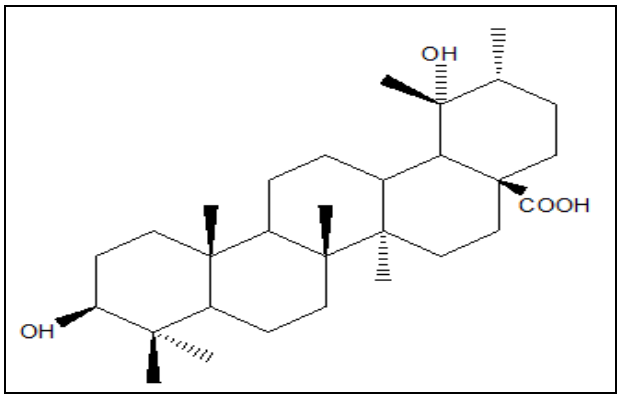

FIG. 15: 3β, 19α-DIHYDROXYURSAN-28-OIC ACID

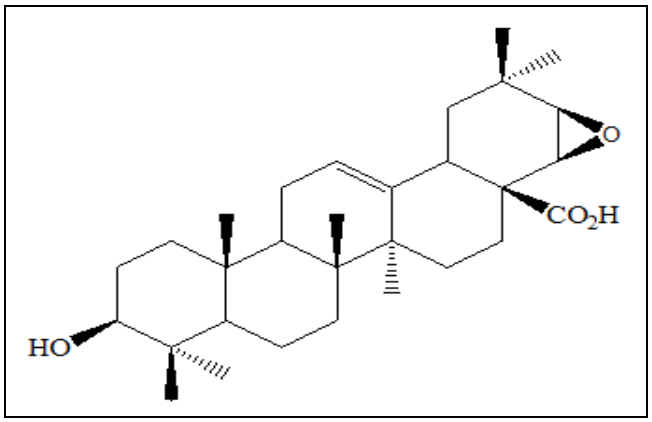

FIG. 16: 21, 22β-EPOXY-3β-HYDROXY OLEAN -12-EN-28-OIC ACID

Khan *et al*., in 2002 presented a GC-MS analysis of Oil collected from leaves and flowers of *Lantana camara* and recorded that *Lantana camara* oils also contain α-cadinene **(Fig. 12)**, β and γ-elemene **(Fig. 13 - 14)**, α-copaene and as major constituents [37]. It was identified and reputed 1, 8-cineole, Sabinene **(Fig. 8)**, α- humulene, β-caryophyllene, 8-hydroxybicyelogermaerene, and sesquiterpenoids humulene epoxide III in leaf and flower oils of *Lantana camara* [38], [39], and [40]. Two novel triterpenoids were also isolated from the roots of *Lantana camara*. Their structures were determined as 3β, 19α-dihydroxyursan-28-oic acid **(Fig. 15)**, and 21, 22β-epoxy-3β-hydroxyolean-12-en-28-oic acid **(Fig. 16)** [41].

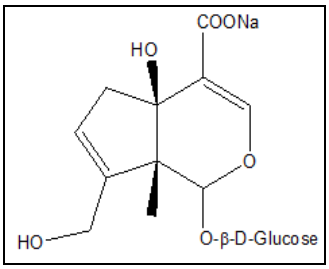

FIG. 17: THEVESIDE

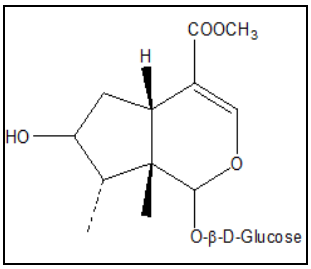

FIG. 18: 8-EPILOGANIN

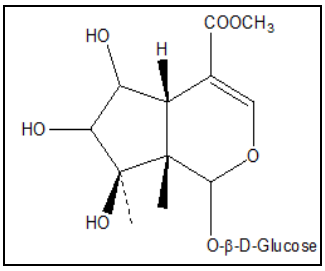

FIG. 19: LAMIRIDOSIDE

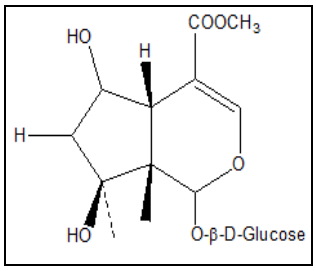

FIG. 20: SHANZHSIDE METHYL ESTER

The white, pink or red flowering taxa yield considerable quantities of the the veside **(Fig. 17)** present as a sodium salt [42], [43]. The leaves included 1.3 - 3.6 % and stem 4.3 - 5.8 % in the spring and summer, decreasing significantly to 0.6 % for both leaves and stems in autumn. Also from the roots geniposide, the biosynthetic precursor of the veside has been isolated together with 8-epiloganin **(Fig. 18)**, lamiridoside **(Fig. 19)** and shanzhside methyl ester **(Fig. 20)** [44], [45].

Singh *et al*., in 1996 isolated two additional triterpenes, hederagenin **(Fig. 21)** and 25-hydroxy-3-oxoolean-12-en-28-oic acid **(Fig. 22)** from *Lantana camara* [46]. Begum *et al*., in 1995 reported a new Δ12-oleanane triterpenoid and a new Δ12-ursane type triterpenoid, camarilic acid **(Fig. 23)** and camaracinic acid **(Fig. 24)** respectively from the aerial part of *L. camara* [10].

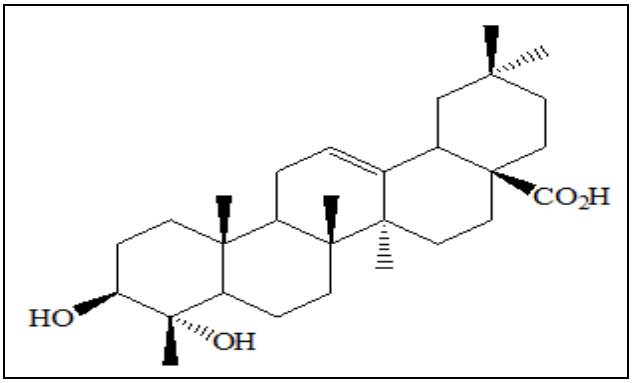

FIG. 21: HEDERAGENIN

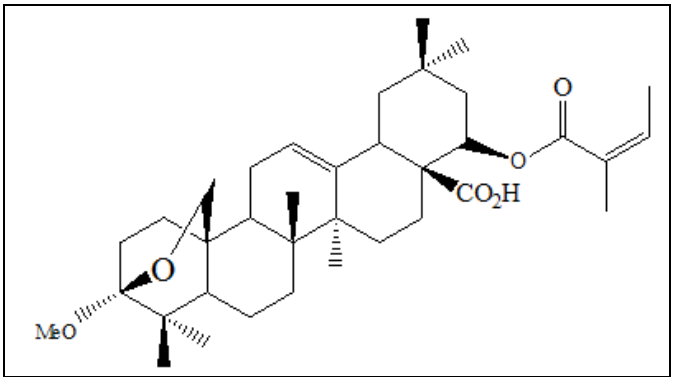

FIG. 23: CAMARILIC ACID

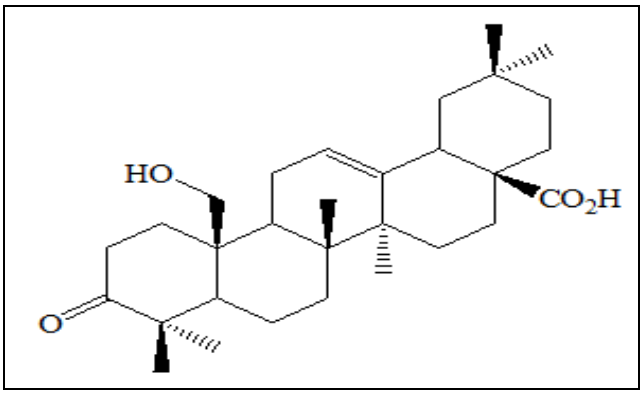

FIG. 22: 25-HYDROXY-3-OXOOLEAN-12-EN-28-OIC ACID

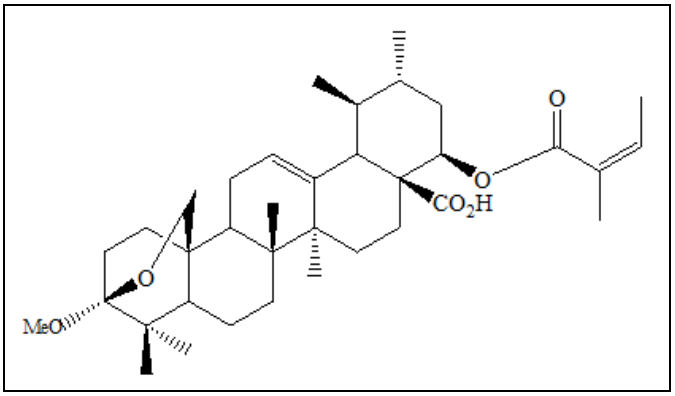

FIG. 24: CAMARACINIC ACID

TABLE 1: USES OF *LANTANA CAMARA*

Parts Used	Uses	References
Plant	Act as hedge plant, provide perch sites and cover	Ghisalberti *et al*., 2000; Day *et al*., 2003
Flowers	Nectar source for butterflies and moths	Mohan Ram and Mathur, 1984; Day *et al*., 2003
Bark	Astringent and used as a lotion in cutiginous eruptions, leprous ulcers	ISSG, 2008; Trek Nature, 2009
Stalks	Raw material for paper pulp which is used for wrapping, writing and printing paper. Making baskets and temporary shelters. Used as Biofuel	Ray *et al*., 2006; Naithani and Pande, 2009; Kannan *et al*., 2008; Sharma *et al*., 1988; Prasad *et al*., 2001
Leaves	Boiled and used for swelling and pain in the body. Alkaloidal fractions lower blood pressure, accelerate deeprespiration and stimulate intestinal movements.	Singh *et al*., 1996; Noble *et al*., 1998; Nagao *et al*., 2000
Plants extract	Drought-tolerant plant so good candidates for xeriscaping. Employed in the folk drug for the treatment of cancers, chicken pox, measles, asthma, ulcers, swellings, eczema, tumors, high blood pressure, bilious fevers, catarrhal infections, tetanus, rheumatism and malaria.	Rauch and Weissich, 2000; Chavan and Nikam, 1982; Sharma and Sharma, 1989; Day *et al*., 2003; Begum *et al*., 2003; Sharma, 2007

CONCLUSION: *Lantana camera* is an important medicinal plant with several medicinal uses in folk and traditional therapeutic system. From this review, it is quite evident that *L. camara* contains some phytoconstituents which reveal its applications for different therapeutic purposes. The Plant or its specific parts can be used for the treatment of various disorders in the human being such as antiulcer, analgesic, anti-inflammatory, antimicrobial, anthelmintic, anti-cancer antifungal, antibacterial and wound healing. *Lantana* oil is sometimes applied for the treatment of skin itches, as an antiseptic for wound and externally for leprosy and scabies. Yet, so much work is required with the *Lanata camara* to investigate the mechanism of actions with other therapeutic activities. In future, there is enormous scope in research for this plant. Ethnomedical and scientific reports about the medicinal properties of *L. camara* represent it as a valuable plant and establishing it as

a candidate for the future drug development. Further examination of *L. camara* plants (active compounds) can be carried out by way of making use of various investigative methods such as HPLC, HPTLC, FTIR, NMR and UV spectrophoto -meter study.

ACKNOWLEDGEMENT: The authors of this paper are very thankful to the managing director of Goel Institute of Pharmacy and Sciences.

CONFLICT OF INTEREST: We declare that we have no conflict of interest.

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How to cite this article:
Ved A, Arsi T, Prakash O and Gupta A: A review on phytochemistry and pharmacological activity of *Lantana camara* Linn. Int J Pharm Sci & Res 2018; 9(1): 37-43. doi: 10.13040/IJPSR.0975-8232.9(1).37-43.