2. LITERATURE REVIEW

2.1 General Overview

Plants have always been the principle sources of medicines around the globe since ancient time. Herbs play an important role in the lives of tribal and rural people, particularly in remote part of developing countries. Obviously, these plants help in alleviating human sufferings. These plants are being integrated to the field of foods as additives, beverage and cosmetics. There has been a rapid extension of allopathic system of medical treatments in our country during the past centuries. However, these drugs have adverse effect on human health and hence people are turning back towards nature with the hope of safety and security. On the other hand, the drugs obtained from the medicinal plants are safe, cheaper, easily available and with no fear of side effects. Moreover, these are more compatible to the human body constitution and suits to the local and cultural need of people. The indigenous methods of preparation maintain the purity of the drug.

Furthermore, traditional folk healers treat with kindness, grace, patience and tolerance which play a vital role in healing process today.

The present research was aimed to investigate the pharmacological screening of some indigenous plants for CNS activities. The comprehensive literature review has been done to reveal the same.

2.2 Review on *Hemidesmus indicus* Linn.

Biyani D.M. (2013)\(^1\) et al prepared and used *Asthamangal Ghrita* for behavioral activity, sleeping time, pain, convulsions, locomotor activity etc. and it was found to be effective in CNS related disorders in mice. It’s a formulation of herbal drugs extracted in the butter fat (Ghee) of cow’s milk. Along with butter fat *Acorus calamus, Brassica campestris, Centella asiatica, H. indicus, Piper longum, Saussurea lappa* and Rock salt were used. All of these drugs along with ghee are claimed to have CNS actions, mostly as calming, sedative, memory enhancing etc. So, it was thought worthwhile to validate the said activities by modern pharmacological screening methods.
Lakshmi T. (2013) et al reviewed that *H. indicus* root extract p.o. in mice has been widely used in anti-nociceptive activity & other activities. It reveals dose-dependent antinociceptive effect in all the mice models and it blocked both the neurogenic and inflammatory pain.

Singh K. (2012) et al showed that the ethanolic extract of *H. indicus* roots had reduced the tonic extensor phase time and depression in maximal electro shock method and the time period of clonus in pentylenetetrazol method and hence showed anti-epileptic activity in roots.

Saryam R. (2012) et al determined physicochemical parameters of *H. indicus* root powder like extractive value, loss on drying and foaming index. Its root extracts were prepared using different solvents like petroleum ether, ethanol and distilled water. The phytochemical screening of the root extracts was performed and showed the presence of alkaloids, glycosides, carbohydrates, steroids, polyphenol, saponins and terpenoids were indicated by the test conducted. The TLC of ethanol and aqueous extracts were studied for Rf values.

Mohamed S.F. (2011) et al evaluated the presence of carbohydrate, tannins, saponins, triterpenoids and flavonoids by phytochemical screening. The hydro-alcoholic extract of *H. indicus* was assessed for analgesic activity (acetic acid model and Eddy’s hot plate model), anti-pyretic activity (brewer’s yeast induced pyrexia model) and anti-inflammatory (carragenan model) and justified the ethnic uses of the plant.


Shete R.V. (2010) et al evaluated nootropic effect of *H. indicus* in mice. The present study was undertaken to assess the potential of rejuvenator drug *H. indicus* roots ethanolic extract, as a memory enhancer by using Elevated plus maze and passive avoidance paradigm. It proved to be a useful memory restorative agent in the treatment of dementia seen in the Alzheimer’s disease.

Shete R.V. (2009) et al evaluated the potential of an ayurvedic rasayana (rejuvenator) drug *H. indicus* roots as a memory enhancer by Elevated plus maze and passive avoidance paradigm, to evaluate learning and memory parameters. The chloroform and *n*-butanol
fractions of ethanolic extract *H. indicus* root (3, 10 and 30 mg/kg, p.o.) were screened in mice.

**Panchal S.J. (2009)** et al reviewed plethora pharmacological studies to show potential of *H. indicus* roots as an anti-inflammatory, anti-carcinogenic, anti-ulcerogenic, anti-microbial, otoprotective, anti-atherogenic and anti-oxidant. Its roots are used in various herbal formulations available in market for treating numerous ailments. Furthermore, now this plant has become an endangered species, hence one should focus on agricultural and climatic needs of plant.

**Austin A. (2008)** et al reviewed about the medicinal properties of *H. indicus* roots. The review was carried out to enumerate the benefits of plant. The highest concentration of glycosides, flavonoids, tannins, resins and sterols were reported in roots. The extractive percentage yield and ash values were also reported.

**George S. (2008)** et al reviewed the *H. indicus* root. The present review shows morphology, anatomy, pharmacology, chemistry and ethno botany along with medicinal importance.

**Lakshman K. (2006)** et al tested *H. indicus* root methanolic extracts orally by carrageenan-induced paw oedema and brewer’s yeast-induced pyrexia in rats, to investigate anti-inflammatory and antipyretic activities respectively. The results indicated that the extracts possess anti-inflammatory and antipyretic properties.

**Verma P.R. (2005)** et al investigated possible antinociceptive activity of alcoholic extract of *H. indicus* root extract in mice. Three models were used to study the nociceptive effects. Models were acetic acid model (Writhing test), hot plate model and formalin model (Paw licking test) in mice. The extract was administered in the dose range of 25, 50 and 100 mg/kg orally 1h prior to pain induction. The preliminary phytochemical screening of the extract showed the presence of triterpenes, flavonoids, glycosides and steroids. The results indicated that alcoholic extract possesses a significant antinociceptive activity. The activity was related with the significant phytochemicals that are triterpenes, flavonoids, and sterols.
2.3 Review on *Lantana camara* Linn.

**Silva T.S.C. (2015)*** et al evaluated anti-nociceptive & anti-inflammatory activities in *L. camara* leaves. The research shows the existence of anti-inflammatory activity in paw edema induced by carrageenan, serotonin and histamine and analgesic activity in the acetic acid writhing and tail-flick models. In conclusion, the findings suggested leaves may have active principles that have potent anti-inflammatory and antinociceptive properties.

**Grewal T. (2014)*** et al studied the methanolic leaf extract of *L. camara* effect for analgesic effect in mice by observing reduction in acetic acid induced writhing’s numbers and indomethacin induced gastric ulcers in rats. LCME also exhibited antioxidant activity as it showed dose dependent increase in total radical trapping antioxidant parameter, scavenging of super oxide radical and decreased lipid peroxidation formation. Further histopathological evaluation confirmed the *L. camara* healing property of gastric ulcers.

**Kazmi I. (2013)*** et al investigated anxiolytic activity of isolated compound called ursolic acid stearoyl glucoside (UASG) from *L. camara* leaves. Column chromatography was used to isolate UASG. Anxiolytic potential was experimentally proved and demonstrated through Elevated plus-maze, open field and light and dark test. Results reveals the UASG produced increased in time spent (%) & number of movements made by animal in open arm of elevated plus-maze apparatus. In light and dark model, UASG showed marked increase in time spent by animal, number of crossing and reduced duration of immobility in light box. Conclusions were found that UASG showed significant increase in number of rearing, assisted rearing and number of squares crossed in open field established test model. UASG showed its anxiolytic effect in dose dependent manner.

Anticonvulsant potential was experimentally proved and demonstrated through Maximal electroshock (MES) induced seizure; Isoniazid (INH) induced seizure and assessment of locomotor activity test. So, concluded, *L. camara* leaves possess anticonvulsant and depressant like effect on CNS due to UASG.

**Chinnala K.M. (2013)*** et al evaluated anti-epileptic activity of ethanolic extract of *L. camara* leaves by Maximal electroshock seizures (MES) and Pentylenetetrazole (PTZ) induced convulsions in Westar rats. It is found that (200 mg/kg and 400mg/kg) significantly (p<0.001) protected the animals especially hind limb tonic extensor stage in MES induced
epilepsy and increase in onset of clonic convulsions comparable with standard treated animals.

Patil S.M. (2012) et al designed to evaluate the anti-inflammatory effect in roots by standard experimental model of acute inflammation that is carrageenan induced rat paw edema test & analgesic effect by acetic acid induced writhing in mice. The activities were done on methanolic extract of roots of *L. camara*. The result showed significantly suppressed paw edema and writhes in mice.

Jose G.M.C. (2012) et al subjected leaves of *L. camara* to hydro distillation and examined the essential oil extracted with respect to chemical composition, antibacterial and antibiotic modifying activity by gaseous contact. Among the 25 identified components, bicyclogermacrene (26.1%), β-caryophyllene (24.4%), germacrene D (19.2%) and valecene (12.0%) were the main constituents. The essential oil volatile constituents inhibited the growth of *Staphylococcus aureus* and *Pseudomonas aeruginosa* with MIC of 1 and > 1 mg/L, respectively. The activity of the antibiotic amikacin was increased by 65% against *S. aureus* and *P. aeruginosa* after contact with the volatile components.

Sanjeeb K. (2012) et al reviewed about its medicinal properties and concluded the ethnomedical and scientific reports about the medicinal properties of *L. camara* represents it as a valuable plant and establishing it as a candidate for the future drug development.

Kalyani L.R. (2011) et al demonstrated that *L. camara* leaves have significant antibacterial and analgesic activities. The chloroform and methanolic extract have showed the presence of four alkaloid compounds each. Antibacterial activity was evaluated using MIC method against bacteria. Furthermore, the analgesic activity of different extracts of leaves was evaluated by Eddy's hot plate method.

Shonu J. (2011) et al investigated and evaluated physical parameter such as the moisture content, ash values, and extractive value, TLC studies, concerning on the antipyretic activity. The results of this study provided a scientific support for the use of *Lantana camara* leaves in the treatment of Pyrexia.

Lakshman K. (2008) et al evaluated the analgesic and anti-inflammatory activity of topical preparation of *L. camara* leaves. Analgesic activity was evaluated with formalin
induced paw licking test in mice by using methyl salicylate as a standard. Anti-inflammatory activity was evaluated with carrageenan induced rat paw edema model in wistar rats using Piroxicam gel as a standard.

Khan M. (2002)\textsuperscript{11} \textit{et al} analyzed the chemical composition of leaves and flowers essential oils of \textit{Lantana camara} from India by GC and GC–MS, which resulted in the identification of 71 and 64 constituents, representing 99.0\% and 97.0\% of the oils, respectively. The major constituents in the leaf oil were germacrene-D (20.5\%), -elemene (10.3\%), -caryophyllene (9.4\%), -elemene (7.3\%), -copaene (5.0\%) and -cadinene (3.3\%). The major constituents in the flower oil were -elemene (14.5\%), -germacrene-D (10.6\%), -copaene (10.7\%), -cadinene (7.2\%), -caryophyllene (7.0\%) and -elemene (6.8\%). A comparison with the chemical composition of \textit{L. camara} oils of different origin showed that two oils were significantly different from others with respect to their major constituents.

Forestieri A.M. (1996)\textsuperscript{12} \textit{et al} manifested a significant analgesic activity which continued until 3 h after administration in ethanolic extract. Only the petroleum ether extract of presented a short analgesic activity. The leaves of \textit{L. camara} were found to contain lantanin, which was identified as the isomeric triterpenes lantaden A and B. For antipyretic activity: yeast-induced pyrexia model in rat, for anti-inflammatory activity: carrageenan-induced paw oedema model in rat and for analgesic activity: acetic acid writhing test model in mouse were used. The preliminary screening, under the experimental conditions used, has confirmed the analgesic, anti-inflammatory and an antipyretic activity of leaves.
2.4 Literature Inference

From the literature review it has been observed so far that, any systematic investigation has not been done to find out the Central Nervous System activities of these two particular selected plants with proper documentations. Therefore, an attempt can be made in this aspect.

Furthermore, at present any official standards are also not available for determining the CNS activity of *H. indicus* L. Stem, leaves and *L. camara* L. Stem, Flowers.

Also, no any documented work has been published yet now so far. Therefore, the present work will be so useful in development of new drugs and their phytochemicals for treatment of CNS disorders.

Hence, the first vital task is to involve such parameters, by which the presence of entire phytochemicals can be identified, allied standardization parameters can be tried to set standards for identifying the quality, purity.

All-in-none pharmacological screening will be useful to validate the efficacy of the selected plants.