3. REVIEW OF LITERATURE

Prabha et al., 2008
Euphorbia tirucalli L. was investigated for analgesic and anti-inflammatory activities. The analgesic activity was compared with aspirin by tail-immersion and acetic acid induced writhing methods. The anti-inflammatory activity against carrageenan induced paw edema in rats was compared with ibuprofen. In both the methods encouraging results were obtained. [120]

Hajera Khatun et al., 2011
Hibiscus sabdariffa L. fruit extracts were investigated for antinociceptive and CNS depressant activity. The CNS depressant activities were evaluated in open field and hole cross tests while analgesic activity was examined using acetic acid-induced writhing test and formalin test in rat. Results suggest that the fruit extract of H. sabdariffa possesses remarkable CNS depressant and analgesic properties. [121]

Hajera Khatun et al., 2011
Hibiscus sabdariffa L. fruit extracts were investigated for antinociceptive and CNS depressant activities and they have reported that, decrease in locomotor activity and increase in alertness indicates the CNS depressant effect. Addition to that, in CNS, GABA plays as a major inhibitory neurotransmitter. Different anxiolytic, muscle relaxant, sedative-hypnotic drugs actions were acting through GABA_A. [121]

Hajera Khatun et al., 2011
Hibiscus sabdariffa L. fruit extracts were investigated for antinociceptive and CNS depressant activity. They reported that, plant’s containing flavonoids, saponins and tannins are useful in many CNS disorders. Earlier investigation on plants suggest that phytoconstituents such as flavonoids and neuro active steroids were found to be ligands for the GABA_A receptors in the central nervous system; which led to the assumption that they can act as benzodiazepine like molecules. [121]

Hajera Khatun et al., 2011
Hibiscus sabdariffa L. fruit extracts were investigated for antinociceptive and CNS depressant activity. In this they have reported that for screening analgesic activity acetic acid induced writhing method was performed by this method attributed visceral pain can be induced in rats. Pain sensation was produced by triggering localized inflammatory response resulting release of free
Arachidonic acid from tissue phospholipid via cyclooxygenase (COX) and prostaglandin biosynthesis. In other words, it is also associated with increased level of PGE$_2$ and PGF$_{2\alpha}$ in peritoneal fluids as well as lipoxygenase products. The increase in prostaglandin levels within the peritoneal cavity then enhances inflammatory pain by increasing capillary permeability. \cite{121}

**Hajera Khatun et al., 2011**

*Hibiscus sabdariffa* L. fruit extracts were investigated for antinociceptive and CNS depressant activity. In this they have reported that, the acetic acid induced writhing method was found effective to evaluate peripherally active analgesics. The agent reducing the number of writhing will render analgesic effect preferably by inhibition of prostaglandin synthesis, a peripheral mechanism of pain inhibition. The abdominal writhing induced by acetic acid was also reported to be less selective and proposed to act indirectly by releasing endogenous mediators stimulating neurons that are sensitive to other drugs such as narcotics and centrally acting agents. \cite{121}

**Hajera Khatun et al., 2011**

*Hibiscus sabdariffa* L. fruit extracts were investigated for antinociceptive and CNS depressant activity and they have reported that, flavonoids have a role in analgesic activity primarily by targeting prostaglandins besides, alkaloids are well known for their ability to inhibit pain perception. \cite{121}

**Mahmoud Hosseini1 et al., 2011**

In this work, possible analgesic effect of clove oil in mice was investigated by hot plate method. Test (55±0.2°C; Cut-off 60 sec) was performed as a base record 15 min before injection of drugs (Saline or 2, 5, 10 and 20% concentrations of Essential oil) and consequently repeated every 15 min. after injection. The study result showed that clove essential oil has analgesic effect in mice. \cite{122}

**Almeida et al., 2001**

In this review article, Plants with Central Analgesic Activity had reported that, pain is a sensorial modality cases represents the only symptom for the diagnosis of several diseases. It often has a protective function. Throughout history man has used many different forms of therapy for the relief of pain, among them, medicinal herbs are highlighted due to their wide popular use. In the relief of pain, opiates are generally considered to act on the CNS exercising their effects through
three opioid receptors (μ, κ and δ), such drugs are especially important for the treatment of chronic pain. Although, morphine has reigned for centuries as the king of painkillers, its rule hasn’t been totally benign. There are concerns about its addictive properties and side effects, which include respiratory depression, drowsiness, decreased gastrointestinal motility, nausea and several alterations of the endocrine and autonomic nervous systems.\[123\]

**Manthan D Janodia et al., 2011**

Anti-Inflammatory and Analgesic Activities of *Callicarpa Macrophylla* Vahl. Root extracts were investigated and had reported that, process of drug discoveries/inventions are elaborate, requiring, on an average 8 to 10 years and costing millions to reach a new drug to the market.\[124\]

**Barua et al., 2011**

Investigation of Impact of *Achyranthes aspera* L. on Protein Profile in Impaired Wound Models and had reported, approximately 25% of drugs in modern pharmacopoeia were derived from plants (phytomedicines) and many others were synthetic analogues built on the prototype compounds isolated from plants. Indian folk medicine comprises of numerous prescriptions for therapeutic purposes such as healing of wounds, inflammation, skin infections, leprosy, diarrhoea, scabies, venereal diseases, ulcers, snake bite etc.\[125\]

**Yadav et al., 2012**

Investigation of Anti-Inflammatory and Analgesic Activities of *Callicarpa macrophylla* Vahl. Root extracts had reported that, several flavonoids isolated from medicinal plant have been discovered to possess significant analgesic effects.\[126\]

**Yadav et al., 2012**

Investigation of Anti-Inflammatory and Analgesic Activities of *Callicarpa macrophylla* Vahl. Roots extracts had reported that, Carrageenan has been widely used as a noxious agent able to induce experimental inflammation for the screening of compounds possessing anti-inflammatory activity. This phlogistic agent, when injected locally into the rat paw, produced a severe inflammatory reaction, which was discernible within 30 min. The development of edema induced by carrageenan corresponds to the events in the acute phase of inflammation, mediated by histamine, bradykinin and prostaglandins produced under an effect of cyclooxygenase.\[126\]
Sangeeta Shrotriya et al., 2007

Anti-Inflammatory and Analgesic Effects of Hedychium coronarium Koenin. that had reported rhizome of Hedychium coronarium Koenin. were subjected to analgesic and anti-inflammatory activities in animal model. Analgesic activity is done by two methods one is acetic acid-induced writhing test and another one is tail flick method. Results are satisfactory. In carrageenan induced rat paw edema test, results showed statistically significant inhibition of paw edema. [127]

Sangeeta Shrotriya et al., 2007

Anti-Inflammatory and Analgesic Effects of Hedychium coronarium Koenin. had reported, studies have been continuing on inflammatory diseases because side effects of the currently available anti-inflammatory drugs pose a major problem during their clinical use. Therefore, development of newer and more powerful anti-inflammatory drugs with lesser side effects is necessary. [127]

Sangeeta Shrotriya et al., 2007

Anti-Inflammatory and Analgesic Effects of Hedychium coronarium Koenin. had reported true analgesic activity can only be ensured by the combination of at least two methods as the acetic acid induced abdominal constriction test can provide false positive results. To investigate whether the test extracts has true analgesic potential, radiant heat tail-flick method was also used. In the tail-flick method indicate the possible involvement of a higher centre. [127]

Seibert et al., 1994

In this article, Pharmacological and Biochemical Demonstration of the Role of COX-2 in Inflammation and Pain reported that, carrageenan-induced paw edema model in rats is known to be sensitive to cyclooxygenase inhibitors and has been used to evaluate the effect of non-steroidal anti-inflammatory agents, which primarily inhibit the cyclooxygenase involved in prostaglandin synthesis. [128]

Vinegar et al., 1969

In this article, Biphasic Development of Carrageenan Edema in Rats reported that, time course of edema development in carrageenan-induced paw edema model in rats is generally represented by a biphasic curve and prostaglandins (PGs) play a major role in the development of the second phase of inflammatory reaction which is measured at 3h. The presence of PGE₂ in the inflammatory exudates from the injected foot can be demonstrated at 3h and period thereafter. [129]
**Crunkhorn and Meacock et al., 1971**
Mediators of the Inflammation Induced in the Rat Paw by Carrageenan reported that first phase of inflammation occurs within an hour of carrageenan injection and is partly due to the trauma of injection and also due to histamine and serotonin component. \[130\]

**Sosa et al., 2002**
Inflammation is a pathophysiological response of living tissue to injuries that leads to the local accumulation of plasmatic fluid and blood cells. Although it is a defence mechanism that helps body to protect itself against infection, burn, toxic chemicals, allergens or other noxious stimuli, the complex events and mediators involved in the inflammatory reaction can be induced, maintain or aggravate many diseases. \[131\]

**Vinothapooshan et al., 2010**
The anti-ulcer activity was investigated in rats by using aspirin, alcohol and pyloric ligation models. The parameters taken to assess anti-ulcer activity were volume of gastric secretion, pH, free acidity, total acidity and ulcer index. The results indicate that the alcoholic extract significantly decreases the volume of gastric acid secretion, pH, free acidity, total acidity and ulcer index with respect to control. \[132\]

**Dinesh Kumar Patidar et al., 2011**
The anti-ulcer effect of aqueous extract of *Murraya koenigii* was studied in Pylorus ligation and NSAIDs induced ulcer model in albino rats. The extract produced significant inhibition of gastric lesion induced by NSAIDs and Pylorus ligation induced ulcer. The result obtained suggesting that extract possesses significant anti-ulcer activity. \[133\]

**Harshada Takawale et al., 2011**
The antiulcer effects of the hydroalcoholic and aqueous extracts of bark of *Caesalpinia pulcherrima* L. evaluated by pylorus ligation models and protection against aspirin induced ulcer method. Volume of the gastric content, pH was investigated & after centrifugation, acidity was determined by titration with 0.01 N NaOH. Ulcer Index & % of protection were calculated. Extracts significantly controlled the aspirin induced ulcer development. \[134\]
**Peskar et al., 1998**

Preliminary studies of *Mammea americana* L. bark/latex extract point to an effective antiulcer effect on gastric ulcer models in mice has revealed that when the gastric mucosa is continuously exposed to potentially injurious agents such as acid, pepsin, bile acids, bacterial products (*Helicobacter pylori*) and drugs, the gastric ulcer prevalence increases.\[^{135}\]

**Toma et al., 2005**

These agents have been implicated in the pathogenesis of gastric ulcer, including enhanced gastric acid and pepsin secretion, inhibition of prostaglandin synthesis and cell proliferation growth, diminished gastric blood flow and gastric motility.\[^{136}\]

**Sharma et al., 2008**

Screening of Antiulcer Activity of *Caesalpinia pulcherrima* L. bark against aspirin induced ulcer in rats has revealed that the ulcers develop when the normal defence and repair mechanisms of the lining of the stomach or duodenum are weakened, making the lining more likely to be damaged by gastric acid. A peptic ulcer is a score on the lining of the stomach, small intestine or oesophagus.\[^{137}\]

**Sanmugapriya et al., 2007**

Botany, Ethno Medicinal, Pharmacological and Therapeutic Applications of *Strychnos potatorum* L. a review which says that aspirin causes mucosal damage by interfering with prostaglandin synthesis, increasing acid secretion and back diffusion of H ions.\[^{138}\]

**Bandyopadhyay et al., 2000**

Antimicrobial and Cytotoxic Activity of the Alkaloids of Amlaki (*Emblica officinalis*) exposes that in stomach, prostaglandins play a vital protective role by stimulating secretion of HCO\(^{-3}\) and mucous, maintaining mucosal blood flow and regulating mucosal cell turnover and repair. Thus the suppression of basal prostaglandin synthesis by NSAIDs results in increased susceptibility to mucosal injury and gastro duodenal ulceration.\[^{139}\]

**Agreus et al., 1997**

Dyspepsia: current understanding and management annual review of medicine enlighten that an ulcer is defined as disruption of the mucosal integrity of the stomach and/or duodenum leading to a local defects or excavation due to active inflammation, ulcer occur within the stomach and/or
duodenum and are often chronic in nature, peptic disorders are very common in India, with 4 Million individuals (new cases and recurrences) affected per year, life time prevalence of PUD in the India is approximately 12% in men and 10% in women. Moreover an estimated 15,000 deaths per year occur as a consequence of complicated PUD. The financial impact of these common disorders has been substantial, with an estimated burden on health care costs of >$ 15 billion per year in India. [140]

**Ariyoshi et al., 1986**

There are number of antiulcer drugs such as H2 receptor antagonists, protonpump inhibitors and cytoprotectants are available for ulceration all these drugs have side effects and limitations. [141]

**Lima et al., 2006**

The aqueous decoction of mango flowers asan antiulcer agent has revealed that ulcer is a major health hazard both in terms of morbidity and mortality. The pathophysiology of gastric ulcer has generally focused on imbalance between aggressive and protective factors in the stomach, such as acid–pepsin secretion, mucosal barrier, mucus secretion, blood flow, cellular regeneration, prostaglandins and epidermal growth factors. [142]

**Das et al., 1997**

Hydroxyl radical was the major causative factor in stress-induced gastric ulceration state that the reactive oxygen species especially hydroxyl radical plays a major role in causing oxidative damage of mucosa in all types ulcers. [143]

**Bandyopadhyay et al., 1999**

Antiulcer activity of *Mukiamader asapatana* on stress induced in rats reveal that, worldwide interest in natural products as preventive and therapeutic agents has led to a greater appreciation of the rich heritage of traditional systems of medicine. Dietary and life style modifications are the basis of ayurvedic medicine, herbal drugs obtained from the plant source are oxygen derived free radicals cause lipid peroxidation, which leads to membrane fluidity, resulting in reduced membrane. Integrity of surface epithelial cells, thereby causing gastric ulcer. [144]

**N L Dashputre et al., 2011**

Gastric ulcer is one of the most prevalent gastrointestinal disorders, which affects approximately 5-10% of people during their life. In recent years, abundant work has been carried out on herbal
medicine to clarify their potential efficacy in gastric ulcer prevention or management. Here, present study was carried out to investigate antiulcer activity of methanol. \[145\]

**Tewari et al., 1996**

Evaluation of anti-ulcer activity of methanolic extract of *Abutilon indicum* L. Leaves in experimental rats let know that in ayurveda, peptic ulcer mostly refers to amlapitta or parinamasula. Amlapitta is a disease of the gastrointestinal tract, especially of the stomach. Amlapitta literally means, pitta leading to sour taste. \[146\]

**Ariyphisi et al., 1986**

Antiulcer activity of aqueous extract of fruits of *Momordica cymbalaria* Hook f. in *Wistar* rats showes that number of drugs including proton pump inhibitors, prostaglandins analogs, histamine receptor antagonists and cytoprotective agents were available for the treatment of peptic ulcer. But most of these drugs produce several adverse reactions including toxicities and even may alter biochemical mechanisms of the body upon chronic usage. \[147\]

**Kumar et al., 2013**

The aim of the study was to determine anti-ulcer activity of stem bark of *Careya arborea* Roxb. On the wistar strain albino rats. The extract was subjected for preliminary phytochemical analysis and was evaluated for anti-ulcer activity against various models such as ethanol induced, cold restraint stress induced and pylorus ligation induced models. Analytical parameters like percentage of ulcer protection was calculated based on ulcer index and gastric juice volume, P\textsuperscript{H} and acidity of gastric juice. Phytoconstituents like tannins and saponins may be responsible for anti-ulcer activity of EECA. \[148\]

**Borelli et al., 2000**

Anti-ulcer activity of ethanol extract of the stem bark of *Careya arborea* Roxb. enlighten that the phytoconstituents like flavonoids, tannins, terpenoids and saponin have been reported in several anti-ulcer literatures as possible gastro protective agents. flavonoids, tannins and triterpenes are among the cytoprotective active materials for which anti ulcerogenic efficacy has been extensively confirmed. \[149\]
**Berenguer et al., 2005**

Pharmacological and toxicological evaluations of *Rhizophora mangle* L. as a potential antiulcerogenic drug. Chemical composition of active extract explains that tannins may prevent ulcer development due to their protein precipitating and vasoconstriction effects. Their astringent action can help precipitating micro proteins on the ulcer site, thereby forming an impervious layer over the lining that hinders gut secretions and protects the underlying mucosa from toxins and other irritants. \[150\]

**Bandyopadhyay et al., 2001**

Gastroprotective effects of essential oil from *Protium heptaphyllum* on experimental gastric ulcer models in rats reveals that generally ulcers develop due to imbalance between aggressive factors such as hydrochloric acid (HCL), pepsin, refluxed bile, leukotrienes (LTs), reactive oxygen species (ROS) and defensive factors such as mucus-bicarbonate barrier, surface active phospholipids, prostaglandins (PGs), mucosal blood flow, cell renewal and migration. \[151\]

**Hemant Nagar et al., 2012**

Factors, such as inadequate dietary habits, excessive ingestion of non-steroidal anti-inflammatory agents, stress, hereditary predisposition and infection by Helicobacter pylori, may be responsible for the development of peptic ulcer. Peptic ulcer is a conglomerate of heterogeneous disorders, which manifests itself as a break in the lining of the gastrointestinal mucosa covered by acid and/or pepsin.

NSAID ingestion is associated with erosions, type C gastritis, ulceration, interference with ulcer healing, ulcer complications and injury to the small and large intestine. Although a number of antiulcer drugs such as H2 receptor antagonists, proton pump inhibitors and cytoprotectants are available for ulceration but all these drugs have side effects and limitations. In duodenal ulcer, acid secretion is high in half of the patient but normal in the rests.

Indomethacin is known to cause ulcer especially in an empty stomach and mostly on the glandular (mucosal) part of the stomach by inhibiting prostaglandin synthesis through the cyclooxygenase pathway. Prostaglandins function to protect the stomach from injury by stimulating the secretion of bicarbonate and mucus, maintaining mucosal blood flow and regulating mucosal turn over and
repair. Suppression of prostaglandins synthesis by indomethacin results in increase susceptibility of the stomach to mucosal injury and gastro duodenal ulceration.

The causes of gastric ulcer pyloric ligation were believed to be due to stress induced increase in gastric hydrochloric acid secretion and/or stasis of acid and the volume of secretion was also an important factor in the formation of ulcer due to exposure of the unprotected lumen of the stomach to the accumulating acid.

Pylorus ligation induced ulcer was used to study the effect of extracts on gastric acid secretion and mucus secretion. The ligation of the pyloric end of the stomach causes accumulation of gastric acid in the stomach. This increase in the gastric acid secretion causes ulcers in the stomach.\textsuperscript{[152]}

\textbf{Pankaj Dixit et al., 2012}

Systematic evaluation of antiulcer activity of herbal formulation ‘Chandanasa\textsuperscript{v}a’ in rats report that to evaluate three formulations of ‘Chandanasa\textsuperscript{v}a’ [commercially made by Baidyanath, Dabur and test (prepared in-house)] for anti-ulcer activity. The activity was evaluated in albino wistar rats against ethanol induced, aspirin induced, cold restraint induced and pylorus ligation induced gastric ulcer models. The formulations were administered orally at the dose of 6 ml/kg. The formulations of ‘Chandanasa\textsuperscript{v}a’ possess significant antiulcer activity in variety of preclinical models.\textsuperscript{[153]}

\textbf{Pankaj Dixit et al., 2012}

Systematic evaluation of antiulcer activity of herbal formulation ‘chandanasa\textsuperscript{v}a’ in rats report that, treatments available for ulcer was generally non-specific and was usually aimed at reducing the production of gastric acid and re-enforcing gastric mucosal protection such as regular food adequate rest and avoidance of ulcerogenic agents such as coffee, alcohol and tobacco.\textsuperscript{[153]}

\textbf{Pankaj Dixit et al., 2012}

Systematic evaluation of antiulcer activity of herbal formulation ‘chandanasa\textsuperscript{v}a’ in rats report that, pylorus ligation induced gastric ulcer model was generally used to study the effect of test drugs on gastric secretions. Ulcers caused by pyloric ligation were due to increased accumulation of gastric acid and pepsin leading to auto digestion of gastric mucosa and break down of the gastric mucosal barrier. The agents that decrease gastric acid secretion and increase mucus secretion were effective in ulcers induced by this method.\textsuperscript{[153]}
Pankaj Dixit et al., 2012
Systematic evaluation of antiulcer activity of herbal formulation ‘chandanasa’ in rats report that stress-induced ulcers were probably mediated by histamine release with enhancement in acid secretion, a reduction in mucus production and generation of free radicals etc., mast cell activation, alterations in prostaglandin generation, cytokine liberation and breakdown of normal cytoprotective mechanism. Ulcers due to cold stress are both due to physiological and psychological factors.\textsuperscript{[153]}

Pankaj Dixit et al., 2012
Systematic evaluation of antiulcer activity of herbal formulation ‘chandanasa’ in rats report that, flavonoidal compounds were proved to have antisecretory and cytoprotective properties due to free radical scavenging activity during lipid peroxidation. Tannins generally have vasoconstrictive and protein precipitating effects, precipitation of protein at ulcer sites forms impervious layer over the lining that hinders gut secretions and protects the underlying mucosa from toxins and other irritants. The action of terpenes includes reduction of mucosal prostaglandin metabolism and gastric vascular permeability.\textsuperscript{[153]}

Kore Kakasaheb et al., 2011
Several non-steroidal anti-inflammatory drugs like aspirin were known to induce gastric damage by suppression of prostaglandins. In the stomach, prostaglandins play a vital protective role, stimulating the secretion of bicarbonate and mucus maintaining mucosal blood flow and regulating mucosal cell turn over and repair. Oxy radicals may play important role in the aspirin induced erosive gastritis. After an initial hydrophobic intermolecular interaction, the free carboxyl group presents in all NSAIDS forms a strong electrostatic bond with the positively charged head group of zwitter ionic phospholipids of mucus layer and, in doing so, increase the phospholipids solubility, and neutralize its surface activity. Thus, NSAIDs topically act on tissue to disrupt the hydrophobic protective lining of the mucus gel layer.\textsuperscript{[154]}

Kore Kakasaheb et al., 2011
Ethanol produces necrotic lesions in the gastric mucosa by its direct toxic effect reducing the secretion of bicarbonate and production of mucous. Increase vascular permeability and decreases non-protein sulfhydryl groups (NP-SH) of gastric mucosa. Also, increase xanthine oxidase activity
and malonyldialdehyde level. The ethanol also depresses tissue level of DNA, RNA and proteins leading to flow stasis and injured area. [154]

**Dilpreet Kaur et al., 2012**
Herbal drugs with anti-ulcer activity enlightens that a peptic ulcer is erosion in a segment of the gastrointestinal mucosa, typically in the stomach (gastric ulcer) or first few centimeters of duodenum (duodenal ulcer) that penetrates through the muscularis mucosae. Contrary to popular belief, ulcer is not caused by spicy food but instead is most commonly due to either an infection or long term use of medications. Standard treatment is a combination of drugs including antibiotics and a proton pump inhibitors. Literature suggests that number of synthetic drugs were used in the management of peptic ulcers but elicit several adverse effects. [155]

**Dilpreet Kaur et al., 2012**
Herbal drugs with anti-ulcer activity enlightens that, Indian herbal plants stand out as being exceptional for its ethnic, ethobotanical and ethno-pharmaceutical use. In this review attempts have been made to know about some plants which may be used in treatment or prevention of peptic ulcers. Various plants like *Cynodon dactylon*, *Ocimum sanctum*, *Glycyrrhiza glabra*, *Ficus religiosa* proved active in antiulcer therapy. [155]

**Sandeep et al., 2011**
Prostaglandins and Bradykinin were suggested to play an important role in the pain process. Depression of locomotor activity is common to most neuroleptics. [156]

**Sudha Parimala et al., 2013**
Analgesia, the international association for the study of pain (IASP) defined pain as an unpleasant sensory and emotional expression associated with actual/ potential tissue damage.

It is a part of the body defence system, producing reflexive retraction from the painful stimulus and tendencies to protect the affected body part while it heals.

Anxiety is an unpleasant emotional experience of daily living characterised by a series of apprehension, uneasiness or impending distress and this feeling is usually associated with changes in autonomic nervous system and behaviour and it affects 1/8th of the total population worldwide and has become a very important area of research in psychopharmacology. [157]
Kavita Gahlot et al., 2011
Pharmacological evaluation of *Gelsemium sempervirens* roots for CNS depressant activity exposes that the aim of the study was to investigate CNS depressant activity of methanolic extract of *Gelsemium sempervirens* roots. The different activities studied were potentiation of pentobarbiton-induced sleep, test for locomotor activity, effect on muscle co-ordination and antianxiety activities. The results of the study reflected that methanolic extract of the roots decreased locomotor activity, produced muscle relaxation and showed antianxiety activity. This substantiates the traditional use of roots of *Gelsemium sempervirens* for CNS depressant activity.  

Kavita Gahlot et al., 2011
Pharmacological evaluation of *Gelsemium sempervirens* roots for CNS depressant activity exposes that, Advance in science and technology has contributed to an enormous improvement in the quality of life of humankind. However, modern life stress, associated trials and tribulation are responsible for the surge in incidence of variety of psychiatric disorders.  

Kavita Gahlot et al., 2011
Pharmacological evaluation of *Gelsemium sempervirens* roots for CNS depressant activity exposes that, path breaking research in psychopharmacology has flooded the market place with drugs for specification. For instance, benzodiazepines (diazepam, nitrazepamlorazipam and alprazolam etc) were the most frequently prescribed synthetic drugs for variety of condition particularly anxiety, depression, epilepsy and insomnia. But these psychoneural drugs have very serious side effects like chronic use of benzodiazepines causes deterioration of cognitive function, physical dependence and tolerance.  

Joy Harris Hoskeri et al., 2011
At present 121 million people are estimated to suffer from depression. CNS depression is considered as an affective disorder characterized by change in mood, lack of interest in the surroundings, apathy, loss of energy, psychomotor retardation, melancholia as well as profound feelings of gloominess, despair and suicidal ideation. The prevalence of CNS depression in general population is estimated to be around 5% and is recognized to be symptomatically, psychologically and biologically heterogeneous. This disorder was characterized by retardation of thinking and activity. In spite of the availability of CNS depressant and antidepressant drugs, depression or anxiety continue to be a major medical problem.
The most widely used animal models for CNS depressant screening were the forced swimming test, actophotometer based locomotion test and rota rod based muscle co-ordination tests. These tests were quite sensitive and relatively specific to all major classes of CNS depressants. [159]

**Bhalke et al., 2011**

The study was designed to evaluate possible effects of various extracts of *Annona reticulata* bark on analgesic and CNS depressant activities in different animal models. All the extracts exhibited significant central analgesic activity in the hot plate method in mice. All the extract showed statistically significant mild to moderate central nervous system depressant activity assessed by locomotor activity assay and pentobarbitone sleeping time test.

Decrease in sleeping latency and increase in sleeping time were classically related to central nervous system depressant drugs. Like many other centrally acting drugs, barbiturates work on the cerebral cortex and thus produced their actions. Pentobarbital and barbiturates class of hypnotic drug act by an allosteric modification of GABA<sub>A</sub> receptor and increases the chloride conductance and potentiates GABA<sub>A</sub> mediated postsynaptic inhibitors. The significant CNS depressant activity is probably due to increase in concentration of GABA in brain.

Central depressant activity along with strong analgesic effect may complement to each other and thus, may be used in variety of painful and excitatory conditions. [160]

**Sambath Kumar et al., 2008**

CNS activity of the methanol extracts of *Careya arborea* in experimental animal model states that the inhibition of pain could arise not only from the presence of opioids and/or opiodiomimetics but could also arise from the presence of phenolic constituents and also steroidal constituents. A number of scientific reports indicated that triterpenoids produced CNS depressant action. [161]

**Dilipkumar Pal et al., 2008**

Evaluation of CNS activities of aerial parts of *Cynodon dactylon* Pers. in mice reports that benzodiazepines were believed to act at specific binding sites that are closely linked to gamma amino butyric acid (GABA) receptors; the binding of benzodiazepines enhances GABAergic transmission. Although the cause of prolongation of diazepam-induced sleeping time is not known, the enhancement of GABAergic transmission might be related to its sedative activity. Prolongation of pentobarbitone-induced sleeping time might be due to tranquilizing action as well as CNS
depressant action. Although the exact mechanism responsible for the sedative action of meprobamate is not clear, it may be due to CNS depressant action or due to enhancement of GABAergic transmission. \[^{162}\]

**Sanjay Patel et al., 2009**

*In-vitro* cytotoxicity activity of *Solanum nigrum* extract against hela cell line and vero cell line exposes that the study was aimed to evaluation of the anticancer activity of the fruits of *Solanum nigrum* on the hela cell line. The fruits of *Solanum nigrum* methanolic extract were tested for its inhibitory effect on hela cell line. The percentage viability of the cell line was carried out by using trypan blue dye exclusion method. The cytotoxicity of *Solanum nigrum* on hela cell was evaluated by the SRB assay and MTT assay. *Solanum nigrum* methanolic extract has significant cytotoxicity effect on hela cell line in concentration range between 10 mg/ml to 0.0196 mg/ml by using SRB assay and study also showed that inhibitory action on hela cell line in concentration range between 10 mg/ml to 0.0196 mg/ml by using MTT assay. From the performed assay, methanolic extract of these drug shows greater activity on hela cell line and little activity on vero cell line and that mean *Solanum nigrum* can be used as anticancer activity. \[^{163}\]

**Ren et al., 2003**

Flavonoids: Promising anticancer agents enlightens that flavonoids were polyphenolic compounds that are ubiquitously in plants. They have been shown to possess a variety of biological activities at nontoxic concentrations in organisms. The role of dietary flavonoids in cancer prevention is widely discussed. Compelling data from laboratory studies, epidemiological investigations, and human clinical trials indicate that flavonoids have important effects on cancer chemoprevention and chemotherapy. Many mechanisms of action have been identified, including carcinogen inactivation, ant proliferation, and cell cycle arrest, induction of apoptosis and differentiation, inhibition of angiogenesis, antioxidation and reversal of multidrug resistance or a combination of these mechanisms. Based on these results, flavonoids may be promising anticancer agents. \[^{164}\]

**Rajib Ahsanet et al., 2009**

Hepatoprotective activity of methanol extract of some medicinal plants against carbon tetrachloride induced hepatotoxicity in albino rats shows that the methanol extracts of plant materials of some plants like *Casuarina equisetifolia*, *Cajanus cajan*, *Glycosmis pentaphylla*, *Bixa orellana*, *Argemone mexicana*, *Physalis minima*, *Caesalpinia bonduc*, belonging to the different
family were studied for hepatoprotective activity against Swiss albino rats with liver damage induced by carbon tetrachloride (CCl₄). It was found that the methanol extract of *B. orellana*, *C. cajan*, *G. pentaphylla* and *C. equisetifolia* at a dose of 500 mg/kg body weight exhibited moderate protective effect by lowering the serum levels of alanine aminotransferase (ALT) or serum glutamate pyruvate transaminase (SGPT), aspartate aminotransferase (AST) or serum glutamate oxaloacetate transaminase (SGOT) and cholesterol to a significant extent. Other methanol extracts of *A. mexicana*, *P. minima* and *C. bonduc* had no effect of lowering blood serum level rather than produced toxicity at the above specified dose. The highest activity of observed for methanol extract of *B. orellana* at a dose of 500 mg/kg body weight and the reduction of serum level of ALT, AST and cholesterol were 52.08%, 57.37% and 52.90% respectively. The hepatoprotective activity was also supported by histopathological studies of liver tissue. Since results of biochemical studies of blood samples of carbon tetrachloride treated rats showed significant increase in the levels of serum enzyme activities, reflecting the liver injury caused by CCl₄ and blood samples from the animals treated with the methanol extracts of *B. orellana*, *C. cajan*, *G. pentaphylla* and *C. equisetifolia* showed significant decrease in the levels of serum markers, indicating the protection of hepatic cells, the extracts of four above plants could afford significant dose-dependent protection against CCl₄ induced hepatocellular injury. [165]

**Rajib Ahsan et al., 2009**

Hepatoprotective activity of methanol extract of some medicinal plants against carbon tetrachloride induced hepatotoxicity in albino rats reported that liver was one of the largest organs in human body and the chief site for intense metabolism and excretion. So it has a surprising role in the maintenance, performance and regulating homeostasis of the body. It is involved with almost all the biochemical pathways to growth, fight for against disease, nutrient supply, energy provision and reproduction. [165]

**Rajib Ahsan et al., 2009**

Hepatoprotective activity of methanol extract of some medicinal plants against carbon tetrachloride induced hepatotoxicity in albino rats reported that, modern medicines have little to offer for alleviation of hepatic diseases and it is chiefly the plant based preparations which were employed for their treatment of liver disorders. But there is not much drug available for the treatment of liver disorders. [165]
Rajib Ahsanet et al., 2009
Hepatoprotective activity of methanol extract of some medicinal plants against carbon tetrachloride induced hepatotoxicity in albino rats reported that, carbon tetrachloride (CCl₄) induced hepatotoxicity model was widely used for the study of hepatoprotective effects of drugs and plant extracts. [165]

Rajib Ahsanet et al., 2009
Hepatoprotective activity of methanol extract of some medicinal plants against carbon tetrachloride induced hepatotoxicity in albino rats reported that, liver damage induced by CCl₄ is commonly used model for the screening of hepatoprotective drugs. The rise in serum levels of AST, ALT and cholesterol has been attributed to the damaged structural integrity of liver, because they are cytoplasmic in location and released into circulation after cellular damages. [165]

Rajib Ahsanet et al., 2009
Hepatoprotective activity of methanol extract of some medicinal plants against carbon tetrachloride induced hepatotoxicity in albino rats reported that, when rats were treated with carbon tetrachloride it induces hepatotoxicity by metabolic activation; therefore, it selectively causes toxicity in liver cells maintaining semi-normal metabolic function. [165]

Rajib Ahsanet et al., 2009
Hepatoprotective activity of methanol extract of some medicinal plants against carbon tetrachloride induced hepatotoxicity in albino rats reported that, carbon tetrachloride is metabolically activated by the cytochrome P-450 dependent mixed oxidase in the endoplasmic reticulum to form trichloromethyl free radical (CCl₃) which combined with cellular lipids and proteins in the presence of oxygen to induce lipid per-oxidation. These result in changes of structures of the endoplasmic reticulum and other membrane, loss of metabolic enzyme activation, reduction of protein synthesis and loss of glucose-6-phosphatase activation, leading to liver injury. [165]

Manokaran et al., 2008
Hepatoprotective activity of Tabebuia rosea and Solanum pubescens against paracetamol induced hepatotoxicity in rats exposed that the present study was to evaluate the hepatoprotective activity of hydroalcoholic extract of Aerva lanata against paracetamol induced liver damage in rats. The
hydroalcoholic extract of *Aerva lanata* (600mg/kg) was administered orally to the animals with hepatotoxicity induced by paracetamol (3gm/kg). Silymarin (25mg/kg) was given as reference standard. All the test drugs were administered orally by suspending in 0.5% carboxy methyl cellulose solution. The plant extract was effective in protecting the liver against the injury induced by paracetamol in rats. This was evident from significant reduction in serum enzymes alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP) and bilirubin.\[166\]

**Manokaran et al., 2008**

Hepatoprotective activity of *Tabebuia rosea* and *Solanum pubescens* against paracetamol induced hepatotoxicity in rats exposed that, paracetamol hepatotoxicity was caused by the reaction metabolite N-acetyl-p-benzoquinoneimine (NAPQI), which causes oxidative stress and glutathione depletion and it was a well-known antipyretic and analgesic agent, which produces hepatic necrosis at higher doses.\[166\]

**Manokaran et al., 2008**

Hepatoprotective activity of *Tabebuia rosea* and *Solanum pubescens* against paracetamol induced hepatotoxicity in rats reported that, paracetamol toxicity was due to the formation of toxic metabolites when a part of it is metabolized by cytochrome P-450. Introduction of cytochrome or depletion of hepatic glutathione is a prerequisite for paracetamol induced hepatotoxicity.\[166\]

**Manokaran et al., 2008**

Hepatoprotective activity of *Tabebuia rosea* and *Solanum pubescens* against paracetamol induced hepatotoxicity in rats reported that normally, AST and ALP are present in high concentration in liver. Due to hepatocyte necrosis or abnormal membrane permeability, these enzymes are released from the cells and their levels in the blood increases. ALT is a sensitive indicator of acute liver damage and elevation of this enzyme in non-hepatic diseases is unusual. ALT is more selectively a liver parenchymal enzyme than AST.\[166\]

**Manokaran et al., 2008**

Hepatoprotective activity of *Tabebuia rosea* and *Solanum pubescens* against paracetamol induced hepatotoxicity in rats reported that assessment of liver function can be made by estimating the activities of serum ALT, AST, ALP and Bilirubin which are enzymes originally present higher
concentration in cytoplasm. When there is hepatopathy, these enzymes leak into the blood stream in conformity with the extent of liver damage.\textsuperscript{[166]}

Manokaran et al., 2008
Hepatoprotective activity of \textit{Tabebuia rosea} and \textit{Solanum pubescens} against paracetamol induced hepatotoxicity in rats reported that liver protective herbal drugs contain a variety of chemical constituents like phenols, coumarins, lignans, essential oil, monoterpenes, carotinoids, glycosides, flavonoids, organic acids, lipids, alkaloids and xanthenes.\textsuperscript{[166]}

Manokaran et al., 2008
Hepatoprotective activity of \textit{Tabebuia rosea} and \textit{Solanum pubescens} against paracetamol induced hepatotoxicity in rats reported that bilirubin was one of the most useful clinical clues to the severity of necrosis and its accumulation is a measure of binding, conjugation and excretory capacity of hepatocyte. Decrease in serum bilirubin after treatment with the extract in liver damage induced by paracetamol, indicated the effectiveness of the extract in normal functional status of the liver.\textsuperscript{[166]}

Velayudam et al., 2012
\textit{CCl}_4 produces an experimental damage that histologically resembles viral hepatitis in which liver necrosis is evident. Toxicity begins with the change in endoplasmic reticulum, which results in the loss of metabolic enzymes located in the intracellular structures. The toxic metabolite trichloromethyl free radical (\textit{CCl}_3) is produced by microsomal oxidase system binds covalently to the macromolecule and causes peroxidative degradation of lipid membranes.\textsuperscript{[167]}

Velayudam et al., 2012
Velayudam reported that, elevated serum transaminases (AST and ALT) indicate the liver necrosis. Clinically, these enzyme levels are elevated in acute hepatitis, chronic hepatitis, chronic alcoholic hepatitis, diffuse intrahepatic cholestasis, extra hepatic obstruction and focal intra hepatic disease.\textsuperscript{[167]}

Velayudam et al., 2012
Velayudam reported that, AST: ALT ratio of 1 to 2 indicates the clinical picture of chronic alcoholic liver disease. Serum level of transaminases returns to normal once the healing of hepatic parenchyma and regeneration of hepatocytes occurs.\textsuperscript{[167]}

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Velayudam et al., 2012
Velayudam reported that, alkaline phosphatase (ALP) is the prototype enzyme that reflects the pathological alteration in biliary flow. Clinically, this enzyme indicates diffuse intrahepatic cholestasis, extra hepatic obstruction and focal intrahepatic disease. CCl₄ induced elevation of this enzyme in the serum is in line with high level of serum bilirubin content. Elevated total bilirubin is a sign for acute hepatitis, chronic hepatitis, chronic alcoholic hepatitis, diffuse intrahepatic cholestasis and extra hepatic obstruction cholestasis. [167]

Velayudam et al., 2012
Velayudam reported that, liver diseases were frequently associated with haematological abnormalities. Anemia of diverse etiology occurs in about 75% of patients with chronic liver disease. In patient with alcoholic liver disease, different effects of alcohol also contribute anemia such as malabsorption, malnutrition or direct toxic effect. Anemia might be caused secondary to hepatic infections or side effects of antiviral drugs used in the treatment of viral hepatitis. Thus anemia of different pathogenesis should be also considered while treating liver diseases. [167]

Maheswari et al., 2008
Maheswari. reported that, liver damage was associated with cellular necrosis, increase in tissue lipid peroxidation and depletion in the tissue GSH levels. In addition serum levels of many biochemical markers like SGOT, SGPT, triglycerides, cholesterol, bilirubin, alkaline phosphatase are elevated. [168]

Valan et al., 2010
Phytoconstituents with hepatoprotective activity states that liver plays a vital role in metabolism and excretion. Liver ailments need to be treated with care. In India, there are about 100 medicinal plants used in 33 herbal formulations. These hepatoprotective plants have the phytoconstituents such as phenyl compounds, coumarins, essential oils, monoterpenoids, diterpenoids, triterpenoids, steroids, alkaloids and other nitrogenous compounds. [169]

Rekha Rajendran et al., 2009
Hepatoprotective activity of Mimosa pudica leaves against carbon tetrachloride induced toxicity shows that the presence of phytoconstituents such as flavonoids, alkaloids and glycosides which are considered as, responsible for the significant hepatoprotective activity. [170]
3.2 PLANT PROFILE

Scientific Name : *Tecoma capensis* (Thunb.) Lindl.
Family : Bignoniaceae

Botanical Classification

<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Plantae</th>
</tr>
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<tbody>
<tr>
<td>(Unranked)</td>
<td>Angiosperms</td>
</tr>
<tr>
<td>(Unranked)</td>
<td>Eudicots</td>
</tr>
<tr>
<td>(Unranked)</td>
<td>Asterids</td>
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<tr>
<td>Order</td>
<td>Lamiales</td>
</tr>
<tr>
<td>Genus</td>
<td><em>Tecoma</em></td>
</tr>
<tr>
<td>Species</td>
<td><em>capensis</em></td>
</tr>
<tr>
<td>Synonyms</td>
<td><em>Tecomaria capensis</em></td>
</tr>
</tbody>
</table>

Vernacular Names

English (tecoma, kaffir honeysuckle, cape honeysuckle);
Africans (kaapsekanferfoelie);
Xhosa (icakatha);
Zulu (uminyane, ugcangca, uchacha)

BOTANICAL DESCRIPTION

*Tecomaria capensis* is an evergreen scrambler to small tree with a roundish crown. Bark pale brown, lenticelled with longitudinal furrows on old stems. Leaves opposite, unevenly compound, up to 13 cm long, with 2-5 pairs of leaflets, terminal leaflet largest, margins coarsely toothed, glossy green above. Fruit a narrow, flat pod-like capsule up to 13 cm long. Seeds with large papery wings. There are 3 garden cultivars; “coccinea” with light red flowers on a bushy plant, “lutea” with bright yellow flowers on a spreading bush and “salmonii” with salmon-coloured flowers. The genus Tecomaria is monotypic and has affinities with Tecoma. exserted, with elliptic, 2-lobed stigma.

ECOLOGY

*T. capensis* occurs on forest margins but more commonly along drainage lines in dense woodland. Grows well in moist areas and in dry scrub and woodland.
Figures-21 *Tecomaria capensis* Flowers

Figures-22 *Tecomaria capensis* Leaves

Figures-23 Whole plant of *Tecomaria capensis*
**Biology**

The cape honeysuckle is dioecious and evergreen, usually flowering after rains from June-November and fruiting from October-February. Pollinated by birds and insects. Calyx 5-lobed, much shorter than corolla tube. Corolla bilabiate, tube curved, narrowly funnel-shaped; one lip 2-lobed; all lobes elliptic, obtuse. Stamens didynamous, inserted in lower part of corolla-tube, exserted; filaments terete; anthers 2- thecous with thecae at length separating. Style terete.

**Biophysical Limits**

<table>
<thead>
<tr>
<th>Altitude</th>
<th>0-1200 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Annual Temperature</td>
<td>22-26°C</td>
</tr>
<tr>
<td>Mean Annual Rainfall</td>
<td>750-1750 mm</td>
</tr>
<tr>
<td>Soil Type</td>
<td>Grows in a variety of soils types.</td>
</tr>
</tbody>
</table>

**Documented Species Distribution**

Exotic Range : Lesotho, Mozambique, South Africa, Swaziland, Tanzania
Native Range : India, Kenya, Singapore, Spain, United Kingdom

**Products**

Fodder : Foliage readily browsed by stock and game.
Apiculture : The flowers are rich in nectar thus attract a number of pollinators especially sunbirds and bees.
Fuel : The plant can be used as firewood.
Medicine : Powdered bark used for treatment of fever, pneumonia and stomach troubles, also rubbed on bleeding gums to promote blood clotting. Leaf decoction used for diarrhoea and for intestinal inflammation. Believed to ease pain and produce sleep.

**Services**

Erosion Control : The cape honeysuckle protects surrounding soil from erosion.
Apiculture : The cape honeysuckle is a rich source of sugar.
Shade or Shelter : Unpruned trees provide adequate shade
Soil Improver : The leaf litter on decomposition improves soil fertility.
Ornamental : A prized ornamental with a showy and profuse bloom, cultivated in several gardens, parks and arboreta.
Boundary or Barrier or Support: The cape honeysuckle is a wonderful fencing plant with good regrowth ability after pruning and normally dense and colourful foliage over a long time.

**Tree Management**
The cape honeysuckle must be pruned, to stay attractive in gardens and enhance flowering. The plant grows fast usually flowering in the second year. Growing should be done in semi shade or full sun conditions. The plant is frost tender and should be protected during the first two winters.

**Germplasm Management**
Seed wings removal must be done before planting.

**Pests and Diseases**
The pathogenic fungus *Phytophthora palmivora* has been detected on *T. capensis* leaves.

**ETHANOBOTANICAL LITERATURE**

**Magda et al., 2004**
Quantification of flavonoids in different organs of *Opuntia dillenii* (ker-gawl) haw and investigation of the spines reported that, in this study phytochemical investigation of the methanolic extract from the flowers of *Tecomaria capensis* Lindl var. *aurea* led to the isolation of ferulic, rutin, luteolin-7-O-β-D-glucuronopyranoside, apigenin-7-O-β-D-glucuronopyranoside and luteloin-7-O-(6-O-E-p.coumaroyl)β-D-glucopyranoside. This is the first report for the isolation of these compounds from this variety. Free radical, superoxide radical scavenging and deoxyribose assay of the isolated compounds where evaluated *in vitro* and the antioxidant effects were compared with the same dose of commercial and standard antioxidants such as vitamin C and BHA [butylated hydroxyl anisol]. [171]

**Reema et al., 2011**
In this study agar diffusion assay and minimum inhibitory concentration (MIC) determinations, *in vitro* were used to evaluate antimicrobial activity of plant extracts against nine bacteria and four fungi. The ethanolic extracts of plant *Tecoma capensis* (Thunb.) Lindl were assayed. *T. capensis* flower extract exhibited strong antifungal activity (17 mm and 0.5 mg MIC) and inhibited moderately methicillin resistant *Staphylococcus aureus* which is reported for the first time. This plant extract showed interesting antimicrobial activity against bacteria and fungi. [172]
**Saini et al., 2012**

In this study they evaluated the potential of wound healing activity of *Tecomaria capensis* leaves extract (TCLE) using different models in rats. (a) Excision wound model, (b) Incision wound model and (c) Dead space wound model. TCLE 5% and 10% ointment were applied topically in excision wound model and incision wound model. TCLE 200 and 400 mgkg$^{-1}$ were given orally in dead space wound model. It improved healing in excision wound model, increased breaking strength of tissue in incision wound model, and increased granuloma breaking strength and hydroxyproline content in dead space wound model. These results showed that TCLE presents significant wound healing activity. \[^{[173]}\]

**Clarkson et al., 2004**

*In vitro* antiplasmodial activity of medicinal plants native to or naturalised in South Africa reveals that in this study they reported *in vitro* antiplasmodial activity of *Tecomaria capensis* (Thunb.) Lindl. The plant extract was tested for *in vitro* activity against a *Plasmodium falciparum* strain D10 using the parasite lactate dehydrogenase (pLDH) assay. It was the first time to possess *in vitro* antiplasmodial activity. \[^{[174]}\]

**Saini et al., 2011**

Evaluation of antioxidant activity of *Tecomaria capensis* leaves extract shows that in this study antioxidant activity of methanolic *Tecomaria capensis* leaves extract (TCLE) was found out by using different *in-vitro* models. It includes free radical scavenging activity of 1,1-Diphenyl-2-picryl-hydrasil (DPPH), ferric reducing antioxidant power, total flavonoid content and total phenolic content. Plant contains much amount of phenolic compounds and flavonoids. Plant shows significant antioxidant activity. \[^{[175]}\]

**Guiso et al., 1997**

Antimicrobial activity of a mixture of two isomeric phenyl propanoid glycosides from *Arrabidaea harleyi* A.H. Gentry reveals that leaves of *Tecoma capensis* contain, together with tecomoside, large quantities of its benzoic and cinnamic esters. A novel glucoside was isolated and, by spectroscopic and chemical data, characterized as 7-O-(p-methoxy) benzoyl tecomoside. Flowers of *T. capensis* contain only tecomoside, together with two phenylethanoid-derived glucosides, cornoside and its rearranged aglycone, halleridone, and rengioside. \[^{[176]}\]
Neeraj Kumar Saini et al., 2012

In this study, they evaluated the potential antipyretic activity of methanolic *Tecomaria capensis* leaves extract using different models in rats. Antipyretic activity was evaluated using brewer’s yeast induced pyrexia model in rats. Methanolic *Tecomaria capensis* leaves extract were given at dose of 100, 200 and 500 mg/kg p.o. Results demonstrated that the methanolic *Tecomaria capensis* leaves extract at the doses of (100, 200 and 500 mg/kg p.o.) significantly decreased the rectal temperature of the rats. [177]  

CONCLUSION FROM THE LITERATURE REVIEW

- From methanolic extract of *Tecomaria capensis* Lindl. flower, ferulic, rutin, luteolin-7-O-β-D-glucuronopyranoside, apigenin-7-O-β-D-glucuronopyranoside and luteolin-7-O-(6-O-E-p coumaroyl)β-D-glucopyranoside has been isolated.

- Free radical, superoxide radical scavenging and deoxyribose assay for the isolated compounds of *Tecomaria capensis* Lindl., flower were evaluated for in vitro antioxidant effects.

- Antimicrobial activity of *Tecoma capensis* plant extracts against nine bacteria and four fungi was evaluated. The ethanolic extracts of plant *Tecoma capensis* (Thunb.) Lindl. were assayed showed a better activity.

- Wound healing activity of *Tecomaria capensis* leaves extract was evaluated using different models in rats. Results showed that TCLE has significant wound healing activity.

- The *Tecomaria capensis* leaves extract was tested for in vitro activity against a *Plasmodium falciparum* strain D10 using the parasite lactate dehydrogenase (pLDH) assay. Results possess in vitro antiplasmodial activity.

- Using different in-vitro models antioxidant activity has been evaluated for *Tecomaria capensis* leaves extract. Results showed significant antioxidant activity.
- Anti-pyretic activity of methanolic extracts of *Tecomaria capensis* leaves was evaluated using different models in rats. Results showed that significant Anti-pyretic activity.

- A novel glucoside was isolated, characterized as 7-0-(p-methoxy) benzoyl tecmoside from flowers of *Tecomaria capensis*.

- From the flowers of *Tecomaria capensis*, compounds has been isolated and anti fungal and anti microbial activity has been done for isolated compounds.

- From the leaves of *Tecomaria capensis* antiplasmodial, anti oxidant, anti pyretic and wound healing activity has been done as of now.

From the literature very few activities has been done in leaves. So I have planned to work on leaves part of *Tecomaria capensis* and to isolate the compound which was present in it.