# CHAPTER - 2

## REVIEW OF LITERATURE

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REVIEW OF LITERATURE

2.1. Aegle marmelos

- **Vinodhini Singanan et al.** has investigated the hepatoprotective Effect of Bael Leaves (*Aegle marmelos*), In this studies, Bael leaves which are also known as Bilva in olden Sanskrit was used as herbal drug and its hepatoprotective effect in alcohol induced liver injury in albino rat was estimated using vital biochemical parameters. The remedial administrations of *Aegle marmelos* leaf fine powder significantly alter the biochemical parameters in the ethanol intoxicated rats and maintained well to the standard level. These consequences evidently imply that, the *Aegle marmelos* have vast hepatoprotective significance. Besides, it is very essential to study the definite phytochemical compounds responsible for this hepatoprotective effect.

- **Rajamanickam Vinodhini et al.** has studied the detoxifying result of *Nelumbo nucifera* and *Aegle marmelos* has been reported by estimation of hematological parameters. This study was to scrutinize the efficiency of *Nelumbo nucifera* and *Aegle marmelos* on general carp exposed to sub-lethal concentrations of collective heavy metals (5 ppm) under laboratory environment. They suggests that the two herbal drugs *Nelumbo nucifera* and *Aegle marmelos* were valuable in struggling the toxic result of heavy metals and more competent in relieving the strain induced by heavy metals. In this method aquatic species could be confined from the effect of heavy metals. They concluded that further exploration is needed to resolve the response to *Nelumbo nucifera* and *Aegle marmelos* in further fish varieties.

- **Balakumar S et al.** has studied that *Aegle marmelos* leaf extracts considerably inhibits the enlargement of all dermatophytic fungi. It was accomplished that the crude extracts prepared by water, ethanol and methanol fractions of the plant *A. marmelos* has effective antifungal activity against
the medical isolates of dermatophytes. Leaves of *A. marmelos* yield an essential oil, 4 alkaloids as well aegelenine and aegeline also reduced tannins, phlobotannins, flavan-3- oil, leucoanthocyanins anthocyanins, flavonoid glycosides, skimmianine, sitosterol, rutin and marmesinin.

- **Pushpendra K et al.** were intended to evaluate *Aegle marmelos*: A Review on its Medicinal Properties focused on the pharmacological activity of *Aegle marmelos*, commonly known as a bael in India. This plant is having immense potential to heal the ailment like diabetes, cholesterol, peptic ulcer, inflammation, diarrhoea and dysentery, anticancer, cardio protective, anti-bacterial, anti-fungal, radio protective, anti-pyretic, analgesic, constipation, respiratory infection, antioxidant, hepatoprotective, wound healing etc. He summarizes the precised information of diverse aspects of *Aegle marmelos* plant used in habitual method of medicine for variety of reason.

- **Surat Laphookhieo et al.** have been reported that Chemical Constituents from *Aegle marmelos*. A novel natural product oxazoline derivative named aegle marmelosine (1) along with eight known compounds (2-9) were obtained from roots and twigs of *Aegle marmelos*. Compounds 1-6 were obtained from the roots while compounds 7-9 were obtained from twigs. Compounds 5 and 6 were also detected from the twigs. All structures were characterized by general 1D and 2D NMR spectroscopic methods.

- **Rekha Warrier et al.** The present study was performed to evaluate the *In Vitro Propagation of Aegle Marmelos L. (Corr.)* from adult plants through improved axillary branching. Rapid clonal micropropagation protocol of *Aegle marmelos (L.) Corr.* was obtained using nodal stem segment of adult tree. Nodal segments were inoculated on three special media combinations with unreliable growth regulator combinations. Initial treatment with BAP (0.10 to 1.0 ppm) for 5 weeks in MS - Murashige and Skoog medium followed by transfer to higher concentration of 6-aminobenzylpurine (BAP) 2.5 mg/l in Woody Plant Medium (WPM) proved most beneficial for the induction of shoot multiplication. The number of proliferated shoots obtained (6.0/explant) was high and transfer to
fresh medium. They have suggested that induction of roots was observed in microshoots 4-5 cm in length treated with 3000 ppm Indole Butyric Acid (IBA), with significantly higher number of roots and longer roots.

- **Alka Chauhan et al.** has evaluated the antifertility studies of *Aegle marmelos* Corr. significant decrease in glycogen content on male albino rats. Following the treatment with *Aegle marmelos* probably could be explained by an inhibition of glycolysis throughout spermatogenesis. This research tested the antifertility result of *Aegle marmelos*. They have reported that oral administration of aqueous extract to male rats brought about a extremely significant reduce in the weights of testes, epididymis, seminal vesicle, ventral prostate and vas deferens. Sperm motility as well as sperm density in the cauda epididymis was reduced considerably, fertility was reduced by 70%. The sialic acid, protein, glycogen, fructose and ascorbic acid contents of the testes and other reproductive tissues were extensively decreased, while the testicular cholesterol content was considerably elevated.

- **Rohini S et al.** The Formulation of mucoadhesive tablet by using *Aegle marmelos* Gum. revealed that *A. marmelos* gum seems to be appropriate for use as a release retardant in the production of sustained release tablets because of its good inflammation, good flow rate and appropriateness for mucoadhesion formulations. From the dissolution study, They concluded that dried *A. marmelos* gum can be used as an excipient for producing sustained release mucoadhesive tablets of diclofenac sodium.

- **Prabhjit Kaur et al.** has investigated the antigenotoxic Activity of Polyphenolic Rich Extracts from *Aegle marmelos* (L.) Correa in Human Blood Lymphocytes and *E.coli PQ 37*. The current paper deals with the antigenotoxic activity of *Aegle marmelos* fruit extracts involving short term assays i.e. the SOS chromotest using *Escherichia coli* PQ37 and the Comet assay in peripheral human blood lymphocytes. The antigenotoxic activity exhibited by the extracts may be attributed the various polyphenolic constituents present in these extracts.
• **Dinesh KS et al.** has evaluated the study on pharmacological and phytochemical properties of *Aegle marmelos* (L.) Corr. Serr. (Rutaceae) has done by. *Aegle marmelos* (L.) Corr. Serr is one of the important plant with several medicinal and nutraceutical properties. *A. marmelos* is commonly known as wood apple plant. *A. marmelos* is belonging to Rutaceae family, the family of flowering plants. *A. marmelos* is known for various medicinal properties in traditional medicinal system and use to cure a variety of diseases. In last few decades, *A. marmelos* is extensively studied for its medicinal properties by advanced scientific techniques and a range of bioactive substances have been secluded from the special part of plant and were analysed pharmacologically. The medicinal properties of this plant represent it as a valuable source of medicinal compound.

• **Purnima Singh et al.** findings has reported that *Aegle Marmelos* increases Gastric Mucosal Protection: Relevance for NSAIDS-Induced Gastric Mucosal Injury reported the gastroprotective effect of *Aegle marmelos* extract. This research was undertaken on aspirin-induced ulcerogenesis in cannulated free-moving rats. They suggests that *Aegle marmelos* promotes ulcer protection by the decline in ulcer index, gastric secretions and raise in the glycoprotein level, gastric mucin content and observance of mucosal epithelium. *Aegle marmelos* protects the gastric mucosa against ulceration by its antisecretory and cytoprotective property.

• **Sandeep Dhankhar et al.** has stated that the *Aegle marmelos* (Linn.) Correa: A potential source of phytomedicine summarizes the various phytochemical and biological evaluations have been reported in the literature for the importance of the *A. marmelos*. So, it has been used in ethnomedicine to exploit its medicinal properties including antidiabetic, antiulcer, antioxidant, antimalarial, anti-inflammatory, anticancer, radioprotective, antihyperlipidaemic, antifungal, antibacterial and antiviral activities. They summarize the information regarding the botany, ethnopharmacology query, phytochemistry, biological activity and toxicity of *A. marmelos* plant.
• Arun K et al. have been reported that the Comparative study on Hepatoprotective activity of Aegle marmelos and Eclipta alba. The current study suggest that, Aegle marmelos and Eclipta alba were shows the important variations in the practical biochemical parameters. The intensity of TBARS in ethanol intoxicated rats increased two fold when compared with the control animals. The levels of GSH, SOD and CAT decreased considerably in the ethanol intoxicated rats. The level of GPx was greater than before in the ethanol intoxicated rats13.

• Rajesh Kumar et al. have been reported that the Insecticidal Activity Aegle marmelos (L.) Correa Essential Oil Against Four Stored Grain Insect Pests. The conclusion highlight the effectiveness of A. marmelos oil as fumigant against insect infestations of stored grains and reinforce the chance of using it as an substitute to artificial chemicals for preserving stored grains14.

• Narayan P et al. has reported that a number of Phytochemical and Pharmacological Profile of Leaves of Aegle marmelos Linn. Extensive investigations have been carried out on different parts of Aegle marmelos and as a consequence, varied classes of compound viz., alkaloids, coumarins, terpenoids, fatty acids and aminoacids have been isolated from its different parts. Broadly, Aegle marmelos leaves contain alkaloids, Phenylpropanoids, terpenoids and other miscellaneous compounds whereas potential pharmacological activity of the leaves are hypoglycemic, anti-inflammatory, antimicrobial, anticancer, radioprotective, chemopreventive and anti-oxidative activity. Anhydroaegeline can be used as marker to standardize the plant material with respective to its potential antidiabetic activity15.

• Remya M et al. investigated that the anti-fertility prospective of Aegle marmelos (Rutaceae) leaves. In vitro effect of Aegle marmelos on human sperm motility due to serve as a ordinary resource of anti-fertility substances. A. marmelos is a medicinal plant whose leaves are claimed to be helpful in the healing of spermatorrhoea. Different concentrations of the ethanol extracts of leaves of A. marmelos
were investigated for their *in vitro* effect on sperm motility. It was found that the extracts had a considerable effect on the motility of sperm\textsuperscript{16}.

- **Sevugan Arumugama et al.** has investigated that the antidiabetic activity of leaf and callus extracts of *Aegle marmelos* was undertaken to find the scope to which calluses isolated from leaf explant of *A. marmelos* has a potential for purpose in diabetes management compared to the common plant material. Curing using extracts from both leaf and callus formed considerable decreases in blood sugar level in streptozotozin diabetic rabbits. Among the different extracts, the methanol extracts of the leaf and callus brought about the highest anti-diabetic effect. They exposed that the *in vitro* callus culture of *A. marmelos* has as much potential in diabetes management as the unique leaf extract\textsuperscript{17}.

- **Nadeem Ahmad Siddique et al.** has estimated the antioxidant activity, quantitative evaluation of phenols and flavonoids in various parts of *Aegle marmelos* existing study, we carried out an competent record of the comparative antioxidant activity in methanolic extract of the selected parts (leaves, root and stem bark) of *Aegle marmelos*. Entire content of phenol and flavonoid was quantitatively evaluated in various parts of *A. marmelos*. The efficiency of radical scavenging activity of leaves extract was about 10 times better than reference antioxidant butylated hydroxy toluene (BHT). They accomplished that the larger amount of phenolic compounds leads to further potent radical scavenging effect as exposed by methanolic extract of *A. marmelos* leaves\textsuperscript{18}.

### 2.2. *Cissus quadrangularis* L.

- **P. Balasubramaniam et al.** has evaluated the antiviral activity of olden system of ayurvedic medicinal plant *Cissus quadrangularis* L. (Vitaceae). Moderately purified methanolic extract of *Cissus quadrangularis* (belonging to Vitaceae member, South Indian medicinal plant) have been estimated for antiviral activity and their phytochemical description. *In vitro* antiviral activity against HSV type 1 and 2, and Vero cells at non-cytotoxic concentration were detected. HSV1 and HSV2 showed
additional sensitivity against the moderately purified compound. Phytochemical investigation showed the existence of the Steroids and Terpenoids¹⁹.

- **Bhagath Kumar Potu et al.** has studied that the petroleum ether extract of *Cissus quadrangularis* (Linn.) increases bone marrow mesenchymal stem cell proliferation and facilitates osteoblastogenesis. To estimate the efficiency of the petroleum ether extract of *Cissus quadrangularis* on the proliferation rate of bone marrow mesenchymal stem cells, the segregation of marrow mesenchymal stem cells into osteoblasts (osteoblastogenesis) and extracellular matrix calcification. This research also aimed to find out the additive effect of osteogenic media and *Cissus quadrangularis* on proliferation, segregation and calcification. The results suggest that *Cissus quadrangularis* stimulates osteoblastogenesis and can be used as precautionary/substitute natural medicine for bone diseases such as osteoporosis²⁰.

- **Sarath Babu K et al** has estimated the antioxidant activity of *Cissus quadrangularis* was carried out to calculate the antioxidant activity of flavonoid rich fraction from *Cissus quadrangularis* Linn on sodium perchlorate induced oxidative stress in rats. Male Albino rats were fed with 0.2% sodium perchlorate to induce oxidative stress. The flavonoid rich fraction of the plant (1mg/100gm, 2mg/100gm) was administered orally along with sodium perchlorate two groups of animals for 30 days. Animals showed improved antioxidant levels in serum, heart, liver, kidney compared with sodium perchlorate treated group. They suggested that a *Cissus quadrangularis* has potent antioxidant property if it possess more flavonoid rich fraction .Therefore, it could be used as a potential antioxidant agent in the healing of variety of diseases²¹.

- **Krunal V et al.** have reported that the Pharmacognostical and Phytochemical Evaluation of Stem of *Cissus quadrangularis* L. The current exploration was therefore undertaken to verify the requisite pharmacognostic values for evaluating the plant material. Phytochemical analysis showed the presence of many basic classes of phytoconstituents like alkaloids, flavonoids, cardiac glycosides and
triterpenes. The purpose of these characteristics will aid future investigators in their pharmacological analyses of this species\textsuperscript{22}.

- **Bhagath Kumar Potu et al** has investigated the anti-osteoporotic activity of the petroleum ether extract of *Cissus quadrangularis* Linn. was done to authenticate the anti-osteoporotic role of the petroleum ether extract of *Cissus quadrangularis* on ovariectomy-induced osteoporosis in rats. The petroleum ether extract of *Cissus quadrangularis* stem seems to own anti-osteoporotic activity in rats. On the basis of results obtained in this study, They concluded that the petroleum ether extract of *Cissus quadrangularis* stem seems to acquire anti-osteoporotic activity in rats. The results of biomechanical and histomorphometrical analysis of the femur bone seems to support the traditional use of this plant in bone related disorders\textsuperscript{23}.

- **Vijayakumari P et al.** has reported the studies on the Physico-Phytochemical and Anti-diabetic Properties of *Cissus quadrangularis* l. and *Solanum torvum* The hydroalcoholic extracts of these plants at dose levels of 200 mg/kg body weight showed promising anti-diabetic activity in the Alloxan- induced model in rats. The overall anti-diabetic activity exhibited by the extracts is found to be low as compared to standard drug Glibenclamide. The *Cissus quadrangularis* rhizome extract exhibited more beneficial anti-diabetic modulating effect on plasma glucose level in Alloxan-induced diabetic rats than the fruits of *Solanum torvum*\textsuperscript{24}.

- **Shah Unnati et al.** has performed the pharmacognostical investigation on *Cissus quadrangularis* Linn revealed that it consists of β-carotene, c kaempferol and quercetin. The stem consists of two unsymmetric tetracyclic tri terpenoids, 21β-diol and onocer- 7-ene-3β, onocer-7-ene-3α, 21 α –diol, two steroidal principles I and II, δ-amyrone, δ-amyrin,. The plant is arranged in the prehistoric Ayurvedic literature as a common tonic and analgesic, with definite bone fracture healing properties and the pharmacognostic analysis done on basis of microscopy, macroscopy and physicochemical parameters\textsuperscript{25}.
• **Merinal S et al.** The current research was intended to assess the antimicrobial activity of diethyl ether, ethanol and aqueous leaf extracts of *Cissus quadrangularis* L. against bacterial pathogens such as *Escherichia coli*, *Klebsiella pneumonia*, methicillin resistant *Staphylococcus aureus* (MRSA) and fungal pathogens such as *Aspergillus flavus*, *Candida albicans* and *Fusarium solani* by *in vitro* agar well diffusion assay. They concluded that the ethanol extract of the plant was found to possess strong antimicrobial activity against tested pathogens.\(^2^6\).

• **Deka DKet al.** has suggested that the preliminary study was undertaken to estimate the effect of methanolic extract of *Cissus quadrangularis* Linn on the curing process of experimentally fractured radius-ulna of dog. *Cissus quadrangularis* treated animals discovered faster initiation of healing process than the control animals on histopathological and radiological examination. The treated group also revealed a diminish in serum calcium level to a larger extent than the control group. Curing was almost complete on 21st day of fracture both the groups.\(^2^7\).

• **Ashutosh M et al.** has studied about the Indian Medicinal Plant *Cissus quadrangularis* Linn. an ethno botanical and ethnomedicinal assessment. The plant *Cissus quadrangularis* commonly known as 'Hadjodi' in Oriya belongs to family Vitaceae. The plant is medicinally important, specially stem which is used to cure various diseases in Indian traditional system of medicine particularly Ayurveda and Unani. All most all parts of the plant are utilized by tribal people. In this review, an attempt has been made to provide utmost information associated with plant *Cissus quadrangularis* to confirm its identity and it has been predicted that this information will be ready to lend a hand for pharmacognostical, phytochemical, pharmacological, toxicological and clinical research in near future.\(^2^8\).

• **Viswanatha Swamy AHM et al.** The current research reports some neuropharmacological activities of methanolic root extract of *Cissus quadrangularis* in mice. Results showed that the *Cissus quadrangularis* considerably reduced acetic acid induced writhings in mice and enhanced in tail flick
withdrawal response. The dose-dependent inhibition of acetic acid induced writhing indicated a peripheral effect, which was more effective than aspirin\textsuperscript{29}. Tail flick analgesic testing is usually measured appropriate for centrally acting analgesic still clear cut dose response relationship.

- **Ngo Bum1 et al.** have been studied that the Sedative and anticonvulsant properties of stems of *Cissus quadrangularis* in mice. The aqueous extract of the stems of *Cissus quadrangularis* powerfully improved the entire sleep time induced by diazepam (50 mg/kg i.p.). It also confined mice against strychnine, pentylentetrazol, n-methyl-daspartate and maximal electroshock - induced seizures or turning behavior and delayed the onset time of seizures induced by isonicotinic hydrazid acid. The reports lead to the ending that the extract of *Cissus quadrangularis* possesses anticonvulsant and sedative properties in mice and could clarify its use in customary medicine in Africa, in the healing of insomnia and epilepsy\textsuperscript{30}.

- **Sukij Panpimanmas MD et al.** has reported the comparative experimental study of the efficiency and side effects of *Cissus quadrangularis*L. (Vitaceae) to Daflon (Servier) and placebo in the healing of acute hemorrhoids. To study efficiency and side effects of *Cissus quadrangularis* L. and micronised purified flavanoid fraction (MPFF) in healing of hemorrhoids. The remedial efficiency of flavanoid mixture, *Cissus quadrangularis* L. and placebo are not dissimilar indicating that they play no task in improving early hemorrhoidal symptoms. Long-term studies should be conducted for property in protective and therapeutic action\textsuperscript{31}.

2. 3. Extraction, Isolation, Pharmacological Method

- Isolation of Alcoholic Extract of Cissus Quadrangularis and Evaluation of In- Vitro Anthelmintic Activity

- **E. Mohanambal et al.** The aim of the present study was the collection and isolation of plant extract of *Cissus quadrangularis* Linn root to evaluate the in vitro anthelmintic activity on earthworm Pheretima
posthuma (Annelida). For the above reason alcoholic and aqueous extract of Cissus quadrangularis Linn root was prepared and the in vitro anthelmintic activity was evaluated. Both alcoholic and aqueous extract of Cissus quadrangularis Linn root were subjected to qualitative phytochemical tests for different constituents and it was confirmed that the plant extract contains constituents such as Phenolic compounds, tannins, proteins, saponins, steroids, carbohydrates, glycosides and triterpenoids etc. The alcoholic extract of Cissus quadrangularis Linn root at 100 mg/ml, caused paralysis and death at 17.00 and 30.67 minutes respectively, while, 200 mg/ml, caused paralysis and death at 8.33 and 18.50 minutes respectively against earthworm Pheretima posthuma when compared with the reference drug piperazine citrate which showed the same at 19.26 and 63.25 minutes, respectively.

• **Achal thakur et al.** has evaluated the phytochemical Studies on *Cissus quadrangularis* Linn. *Cissus quadrangularis* Linn. (Family: Vitaceae) is an ancient medicinal plant, named as Hadjod in Hindi. A triterpene δ-amyrin acetate (1), aliphatic acid hexadecanoic acid (3) and stilbene glucoside trans-resveratrol-3-O-glucoside (9) were isolated for the first time from the stems of *Cissus quadrangularis*, along with previously reported compounds namely, δ- amyrone (2) d-amyрин (4), β-sitosterol (5), kaempferol (6), quercetin (7) and resveratrol (8). The structure elucidation of the isolated compounds was performed by spectroscopic techniques (IR, UV, $^1$H-NMR, $^{13}$C-NMR and MS) and by direct comparison with literature.

• **Ampai Panthong et al.** has studied the analgesic, anti-inflammatory and venotonic effects of *Cissus quadrangularis*, a medicinal plant indigenous to Asia and Africa, is used for many ailments, especially for the treatment of hemorrhoid. The effects associated with hemorrhoid, i.e. analgesic and anti-inflammatory activities as well as the venotonic effect of the methanol extract of *C. quadrangularis* (CQ) were assessed in comparison with reference drugs. In the analgesic test, CQ provoked a significant reduction of the number of writhes in acetic acid-induced writhing response in mice. CQ
also significantly reduced the licking time in both phases of the formalin test. The results suggest peripheral and central analgesic activity of CQ. In acute phase of inflammation CQ elicited the inhibitory effect on the edema formation of the rats’ ear induced by ethyl phenylpropiolate as well as on the formation of the paw edema in rats induced by both carrageenin and arachidonic acid. It is likely that CQ is a dual inhibitor of arachidonic acid metabolism. In addition, CQ exerted venotonic effect on isolated human umbilical vein similarly to the mixture of bioflavonoids, i.e. 90% diosmin and 10% hesperidin. The results obtained confirmed the traditional use of *C. quadrangularis* for the treatment of pain and inflammation associated with hemorrhoid as well as reducing the size of hemorrhoids.

- **Klaokwan Srisook et al.** has evaluated the anti-inflammatory effect of ethyl acetate extract from *Cissus quadrangularis* Linn may be involved with induction of heme oxygenase-1 and suppression of NF-κB activation. *Cissus quadrangularis* (family: Vitaceae) has been widely used in traditional herbal medicine for the treatment of hemorrhoids, gastric ulcers and bone healing. In the present study, we determined the anti-inflammatory activity and the molecular mechanism of the ethyl acetate extract of *Cissus quadrangularis* stem (CQE) in LPS-stimulated RAW 264.7 macrophage cells.

- **Emmanuel T et al.** has studied the Acute mammalian toxicity of four pesticidal plants. Many plant species show potential as alternatives to synthetic pesticides but little is known about their acute mammalian toxicity. The single-dose acute oral toxicities of crude aqueous extracts of *Strychnos spinosa* and *Bobgunnia madagascariensis* fruits and the foliage of *Vernonia amygdalina* and *Cissus quadrangularis* (plant species that are commonly used as pesticides in Southern Africa) were evaluated in BALB/c mice. Plant extracts (up to 75% w/v or v/v) were orally administered to sexually mature mice. Behavioural changes, clinical signs and mortality were monitored for 4 days. Mice that received *S.spinosa* had generalized tonic muscle spasms and a high mortality of 83%. Those that received *B.madagascariensis* exhibited signs of buccal and nasal irritation with occasional
sneezes during administration and a high mortality of 75% was recorded. *C. quadrangularis* consumption resulted in much lower mortality of 21% while no clinical signs of toxicity were evident on mice administered *V. amygdalina*. Chemical analysis showed the presence of secoiridoids in the seedless pulp of *S. spinosa*. These results indicate that aqueous extracts of *S. spinosa* and *B. madagascariensis* fruits and foliage of *C. quadrangularis* may have deleterious health implications on humans and animals; hence, advice on their safety should accompany promotion of their use.36.

- **Enechi, O.C. et al.** Effects of ethanol extract of *Cissus quadrangularis* on induced gastric ulcer in rats. Antiulcer activities of the ethanol extract of *Cissus quadrangularis* roots on indomethacin and ethanol-induced gastric ulcers were investigated. The results obtained show that the ulceration in gastric linings of the stomach of rats pre-treated with the *C. quadrangularis* extract before induction with ethanol and indomethacin decreased significantly when compared to the control. The protective effect of the extract increased in a dose-dependent manner in both ulcer models. There were significant decreases (p <0.05) in the number of ulcer lesions when rats were administered with the graded doses of the extract and ranitidine (100 mg/kg body weights) compared with the control groups in both models. Results from this study suggest that the extract of *C. quadrangularis* roots possesses antiulcer activities37.

- **Suresh Kumar et al.** has stated the plants and Plant Products with Potential Anticonvulsant Activity – A Review Epilepsy is a chronic and often progressive disorder characterized by the occurrence of epileptic seizures, affecting about 50 million people worldwide. The prescribed synthetic drugs for the treatment of epilepsy are associated with severe side effects and addiction liabilities upon long term uses. Thus, researchers around the globe are searching for newer, effective and safer drugs from natural resources. The present review emphasizes pharmacological reports on anticonvulsant plants, plant products and formulations. Various chemical constituents (with structures) isolated from different plants responsible for anticonvulsant activity and their possible mechanism of actions have
been incorporated in this review. The review has been compiled using references from major databases like Chemical Abstracts, Medicinal and Aromatic Plants Abstracts, PubMed, Scirus, Google scholar, Open J Gate, Scopus, Science Direct and Online Journals, and includes 599 references. Preliminary anticonvulsant activity studies have been carried out on crude extracts of traditionally used and medicinally promising plants. Such plants need to be explored properly with a view to isolate anticonvulsant constituents, and to evaluate their possible mode of actions.\textsuperscript{38}

- **Arumugam. S et al.** has stated that the present study the effect of ethanolic (95\%) extract of *Guettarda speciosa* on antioxidant enzymes in rat brain after induction of seizures by MES and PTZ were in which Superoxide dismutase, glutathione reductase, glutathione peroxidase, and catalase was significantly (P<0.01) decreased in rat brain due to convulsion and it was considerably (P<0.01) restored by administration of ethanol extract of *Guettarda speciosa* treated rats. Related dose dependent results were obtained in PTZ model also. Whereas EEGS notably decreased lipid peroxidation in both models. The anticonvulsant activity of EEGS might be due to the presence of antioxidant properties and it delays the generation of free radical in MES & PTZ induced epilepsy\textsuperscript{39}.  