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Therapeutic Role of *Cissus quadrangularis* and Their Active Constituents in Disease Prevention and Treatment

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***Abstract*—** *Cissus quadrangularis, commonly known as Veldt grape, is a member of the Grape family and its known for its vital role in helping bone density promotion because of its attributed rich in minerals such as Calcium. Cissus quadrangularis is widely used in ayurvedic, chinese, and unani medicines worldwide owing to the fact that it can cure many diseases. Due to the overwhelming influences of chemical drugs and side effects caused by them studies related to pharmacological activities of plant and plant related sources are encouraged. However, only few medicines are reported in the traditional medicine community. Therefore, in this review paper we have revealed the overall information of important documented potential pharmacologically activities of Cissus quadrangularis in detail.*

***Keywords*—** *CQ, analgesics activity, pharmacological properties, antioxidant activity, anti-osteoprotic activity.*

I. INTRODUCTION

In the contemporary environment, where a number of unique infections and diseases are in horizon, there is a demand for the development of novel drugs. Designing novel medications to fight the widely disseminated infections presents significant challenges to the pharmaceutical industries. Many of the chemical medications used to treat different infections cause human beings to experience one or more adverse effects. As a result, the quest for a cure has caused the world to shift to natural resources. Natural resources contain substances that have the potential to be used to address the present situation because they are said to contain biologically active ingredients with a wide range of biological activities. Natural plant products offer a valuable starting point for the creation of new medicines (Balunas and Kinghorn, 2005). Herbal therapy has roots in ancient civilizations. It entails the use of plants as medicines to cure illness and improve people's overall health and wellbeing with minimal to nil side effects. In reality, many pharmaceutical drugs are man-made derivatives of naturally occurring plant compounds.

Collecting information on substances that have been claimed to treat diseases is the first stage in drug research. There is worry that indigenous herbal medicine knowledge is in danger because it is customary to share knowledge of medicinal plants and its appropriate usage (Bhatia et al, 2014). For the creation of new medications that will be more beneficial to patients, it is urgent to preserve and record the traditional uses of medicinal plants and herbs that have been demonstrated through study procedures and various experiments Bunalema et al 2014).

Cissus quadrangularis (CQ), commonly known as veldt grape/ Pirandai/Hadjod, is a dicoteledonous flowering, perennial herb with a thick quadrangular fleshy twig. It is native to hot regions such as India, Srilanka, Bangladesh, Malaya, Thailand and Africa (Bhuvanasreee et al., 2013; Valli and Vaseeharam, 2012; Sawangjit et al., 2017). It has been used for centuries as a drug for treating various ailments (Kumar and Jegadeensan , 2006; Gupta and Sharma, 2008: Mishra et al., 2010). Traditionally dried powder of the plant has been used, recent studies on methanolic and ethanolic extracts of the plant has also reported many biological activities. The health benefits of *CQ* are covered by numerous patents, the majority of which are centred on the plant's ability to repair broken bones, anti-osteoporotic activity, blood sugar, and lipid homeostasis. There are numerous natural remedies. There are a number of herbal formulations released in the market that contain CQ. The pharmacological activities of the phytochemicals in CQ have not been the subject of a systematic study, so an attempt has been made to identify these activities.

Taxonomy

Kingdom	Plantae – plants
Subkingdom	Tracheobionta – Vascular plants
Superdivision	Spermatophyta – Seed plants
Division	Magnoliophyta – Flowering plants
Class	Magnoliophyta – Dicotyledons
Order	Rhamnales
Family	*Viaceae* – Grape family
Genus	*Cissus* L. – Treebine
Species	*Cissus quadrangularis* L.

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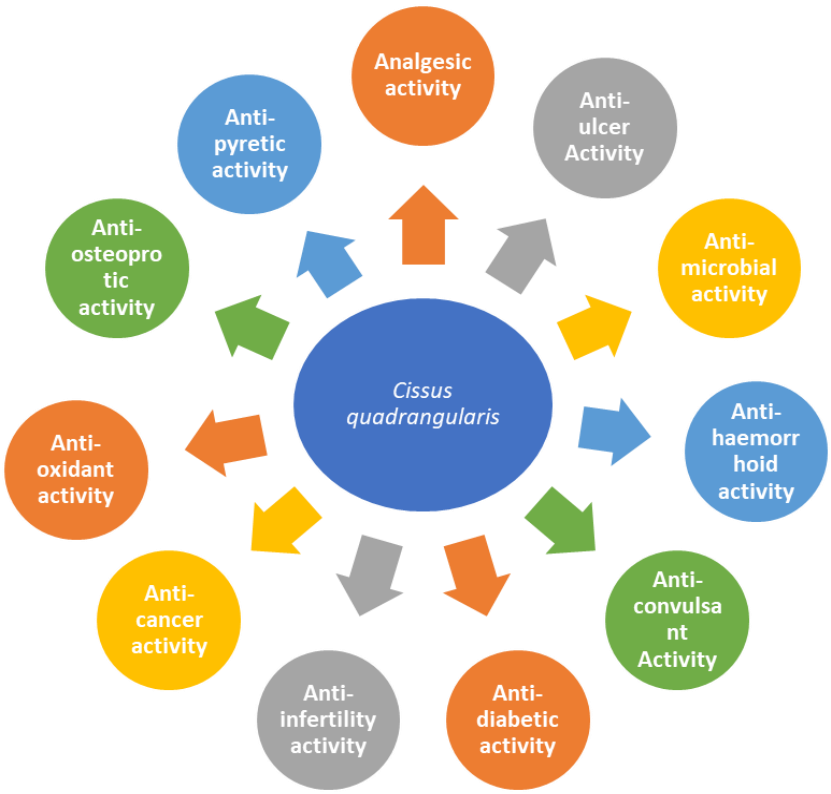
Phytochemical Analysis of CQ

CQ is rich is a rich source of minerals, vitamins and other nutrients. As compared to leaves and root, the stem, serves as rich source of calcium (1.68, 1.51, 1.76 g per 100 g) and phosphorous (1.42, 1.26, 1.82g per 100 g) respectively and also has a high concentration of fat as compared to the roots, whereas the root contains high amount of proteins and carbohydrates than the stem and the leaves. CQ is also rich in antioxidants such as ascorbic acid (480 mg per 100g) and β carotene (267 units per 100g). Previous studies have also reported the presence of various phyto-constituents such as - flavonoids, triterpenoids, stilbene derivatives, phytosterols. The most common among them being – sitosterol. Amyrin, ascorbic acid, quadrangularis A, B and C.

Studies on the phytochemistry of methanol extract of CQ reveal to contain triterpenes such as α- and β - amyrins, and β-sitosterol, and ketosteroids, phenols, tannins, carotenoids, and vitamin C. There have also been reports of seven alicyclic lipid components from CQ. Unsymmetric tetracyclic triterpenoids like 3,3',4,4'-tetrahydroxy biphenyl, 3,3',4,4'-tetrahydroxybiphenyl, d-amyrin, onocer-7-ene-3a, 21b-diol, and damyrone have been isolated from plants and were quantitatively determined by HPTLC and HPLC methods in samples collected from five different geographic zones of India (Bhutani,et al., 1984).There are numerous additional components found in plants, including the flavonoids quercetin and kaempferol, as well as stilbene compounds, quadrangularins A, B, and C, resveratrol, piceatanon, pallidol, perthenocissi, and phyto-sterols. High concentrations of calcium ions and phosphorus, both of which are necessary for bone development, are present in stem extract (Dekha et al., 1994). Seven new compounds are 4-hydroxy 2-methyl-tri cos-2-e n-2 2-one,9-methyl-octadec-9 ene, Heptadecyloctadecanoate, icosananyl cyclohexane, 31-methyl tritriacontan-1-ol, 7-hydroxy-20-oxo-docosanyl cyclohexane, 31-methyl triacontanoic acid. Taraxeryl acetate, fridelan-3-one, taxaxerol and iso-pentacosanoic acid (Anuj, et al., 2011) is obtained from *CQ*.

Pharmacological properties of CQ

CQ is used medicinally in a variety of places despite its usual claim to origin in Ayurveda. It was traditionally known as the "Bone Setter" because it was primarily used to treat female disorders (menopause, libido, and menstrual disorders) as well as bone disorders (increasing bone density or speeding fracture healing rates - Hadjod). These ancient folklore properties of *CQ* with various other pharmacological activities proved by preclinical and clinical studies is as summarised below –



Analgesic activity

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Analgesics activity is the property of a compound to selectively relieve pain without changing consciousness by acting in the CNS and peripheral pain mediators. *C. quadrangularis* has been traditionally used from ancient period to treat pain and painful conditions. (Gupta et al., 2008; Naveen Kumar and Joshi, 2019) The analgesic potential of *C. quadrangularis* has been proved by Panthong et al., 2007 by the most accepted animal study methods such as hot plate method tail flick method, formalin pain method, Haffner's tail clip method, that mimic centrally and peripherally elicited pain. Their study revealed the strong analgesic potency of the plant even at low concentration – 10, 20, 40mg. The analgesic effect was much significant as compared to aspirin by both i.p and oral routes, when assessed by Haffner's clip and Eddy's hot plate methods ($P< 0.001$). And also, the effect lasted for 2 to 4 hours at 1/20th-1/10th of LD50 dose (Viswanatha SAHM et al., 2006; Shirwaikar A et al., 2003). The analgesic property of the plant may be attributed to the presence of phytochemicals such as phytosterols (β- sitosterol and β-sitosterol glycoside), terpenoids, and phenolic compounds like resveratrol, quercitin and kaempferol. The methanol and chloroform extracts of the plant that are rich in the above phytochemicals have proved to exhibit higher analgesic effect as compared to other extracts. The plant might exhibit analgesic effect by, opiodergic, serotonergic pathway (Nie et al., 2015), inhibition of prostaglandin synthesis (Panthong et al., 2007), inhibition of central or peripheral components (Mate et al., 2008) or inhibition of nociceptors (Vijay and Vijayvergia 2010).

Anti-pyretic activity

Antipyretics are compounds that help reduce elevated body temperature. According to Vijay and Vijayvergia (2010), different serial preparations of the *CQ* reduced ($p\leq0.01$) the hyperpyrexia caused by a dried yeast injection in rats, with the effect becoming apparent 18 hours after the extracts were administered. Anti-pyrexia may be achieved by inhibition of prostaglandins, which in turn can be achieved by inhibition of cyclooxygenase (Muhammad et al., 2012). Various extracts of *C.quadrangularis*, including, methanol, ethanol, hexane, ethyl acetate all have been reported to exhibit significant inhibitory effect on cyclooxygenase (Bhujade et al., 2012) The inhibitory effect of the plant may be attributed to the presence of flavonoids, terpenoids and other constituents.

Anti-oxidant activity

Antioxidants are the substances that that protects cells from damage by free radicals, they help reduce free radical induced illness by giving up hydrogen radicals to the primary radicals which get reduced to non-radical chemical compounds and then get changed to oxidized antioxidant radicals. When left untreated, free radicals generation and defective antioxidant defence can lead to various health issues such as cardiovascular diseases, cancer, diabetes, rheumatoid arthritis, chronic kidney disease and many more. The free radical scavenging property and anti-lipid peroxidative properties of *C.quadrangularis* is known for ages. Phytochemicals such as quercitin, kaempferol, resveratrol, quercitin, ascorbic acid contribute significantly to the antioxidant property of the plant. (Li et al., 2008; Moto et al., 2018) The antioxidant property of the plant is proved by different methods including, DPPH, H2O2, reducing power assay, ABTS, B-CLAMS, folin and FAPS test (Marume et al., 2017; Chidambara Murthy et al., 2003) Their study have revealed that the leaves of CQ possess high free radical scavenging and antioxidant property than the stem, with EC50 21.04 $\pm$ 3.00 µg/ml. According to the study by Chidambara Murthy et al., 2003, ethyl acetate extract of CQ exhibited highest antioxidant activity as compared to other extracts when tested by B-CLAMS assay. CQ when compared to catechin exhibited highest scavenging activity (8.0 $\pm$ 6.7%) in hydroxyl radical scavenging assay and a similar scavenging effect (75.3 $\pm$5.3%) when tested by superoxide anion assay (Jainu and Devi 2005). The prominent oantioxidant property of CQ is also attributed to the presence of β-carotene (Palu A et al., 2010). Resveratrol, the most prominent antioxidant in CQ has evidential beneficial effect on chronic neurodegenerative and cardiovascular diseases (Singh et al., 2013), which it exhibits by upregulation of AMPK, NRF2, HO1, NO, G6PD, and down regulation of COX1, NADPH oxidase, iNOS, lipid peroxidase (Gerszon et al., 2014; Reege et al., 2014) or by inhibition of beta-amyloid protein aggregation (Bastianetto et al.,2015). Diminishing effect on platelet aggregation, IL-6, IL-8, GM-CSF, LDL oxidation, ROS production or autophagy induction by resveratrol may contribute to Cardioprotection property (Bonnefont Rousselot, 2016; Petrovski et al., 2011). Pretreatment by CQ reversed the effect caused by carbon tetrachloride on the levels of aspartate aminotransaminase (AST) and alanine aminotransaminase (ALT), alkaline phosphatase (ALP), superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx) and reduced glutathione (GSH) proving the increased antioxidant activity and inhibitory effect on lipid peroxidation and free radical production (Jainu M and Devi CS, 2005; Pratt DE, 1994)

Anti-osteoprotic activity

In recent years, osteoporosis has grown to be a serious health risk, affecting more than 2000 million people globally. Low bone mass is the result of a chronic, progressive disease involving the micro-architectural deterioration of bone tissue. Lack of certain hormones, especially oestrogen in women and androgen in men, is the primary cause of osteoporosis. Bones deteriorate due to deficiency of calcium. Post-menopausal women are at a greater risk, due to the decreased ability of the body to regulate calcium levels resulting in an imbalance in the actions of osteoblasts and osteoclasts cells (Ogey A et al., 2001; Peng Z et al., 1994; Sanyal A et al., 2005; Deka DK et al., 1994)

CQ exhibits positive effects on the recovery of bone mineral density in postmenopausal osteoporosis and greatly inhibits antianabolic effects. In a study, ethanol extract of CQ was tested for its ability to prevent osteoporosis in rats with ovariectomized skeletons at two distinct dose levels: 500 and 750 mg/kg per day. The results, evaluated based on biomechanical, biochemical, and histopathological parameters,

demonstrated a clear antiosteoporotic impact of the plant's ethanol extract (Singh L.M., and Udupa K.N., 1962; Chopra S.S., et., 1976; Singh SP., et al., 1984). In another study by Parisuthiman et al., 2009, treatment with CQ increased the ALP and minerilsation of MC cells and m-RNA expression of genes was unaffected. Suggesting the regulatory effect of CQ in osteoblastic activity by MAPK-dependent ALP activity and linked to quercitin. Oral intake of CQ along with Zingiber officinale, for a month has reported to reduce joint swelling, pain and tenderness in osteoporotic and fractured patients (Viswanath et al., 2017; Navin Kumar and Joshi, 2019). The antiosteoporotic activity of CQ may be attributed to the steroidal content, that acts as phytoestrogen preventing bone loss (Bahram et al.,1996), suppress bone resorption due to estrogen deficiency (Potun et al., 2009)

Anti-cancer activity

Various phytochemicals isolated from plants including camptothecin, vincristine, paclitaxel have approved anticancer properties (Zhang et al., 2020). Cissus quadranularis has a scientific basis for its use as a traditional treatment for cancer patients as the aquoeus extract of the whole plant has been proved to inhibit HepG2 cell growth (Opoku AR et al., 2000). Resveratrol is also a powerful anti-cancer substance derived from the aqueous extract of Cissus quadrancularis plant that induce death of human tumour cells by CD95 signalling. Additionally, the plant also possesses anti-cyclo-oxygenase activity (Climent MV 1992) which gives it its anti-cancer properties. A dose dependent anti-tumour and anti-cancer activity of CQ has been demonstrated against various cancers, such as, breast cancer (MCF-7 breast cancer cell lines and DMBA induced breast cancer), leukemia (HL-60 leukemic cell lines), osteosarcoma (MG63 human osteosarcoma cell lines) and Dalton's ascetic lymphoma. 100mg/kg of chloroform and ethanolic extract of CQ is investigated for its activity against DMBA induced breast cancer as compared to the standard drug Letrozole. (Hemalatha et al., 2017; Nalini et al., 2011). It is reported to reverse all biochemical changes caused due to DMBA in rats, including the levels of creatinine, urea, SGOT, SGPT, WBC, RBC, Hb, SoD, GSH catalase and GPx levels.

Various scientific studies report that quenching of free radicals by anti-oxidants enhance apoptosis leading to inhibitin of tumerogenesis (Gibelline et al., 2010). CQ is rich in antioxidants,that are capable of protecting the cell from mutation and carcinogenesis. Flavanoids and many polyphenols from varius plants are reported to have mechanisms that cause anti-cancer activity, for example, enzyme detoxification, apoptosis initiation, anti-proliferative activity, estrogenic/antiestrogenic action, pro-oxidant action (Mutha et al., 2021; Medzhitov, 2010).

Anti-infertility activity

Shreds of evidence from invitro studies indicate that CQ has significant effect in increasing the sperm count as well as reversal of abnormalities of sperm caused in rats toxicated by lead acetate (Santhosh Kumar et al., 2018). Treatment with CQ visibally reduced the abnormalities in spermatozoa, indicating the role of CQ in treating sperm morphology. A dose dependant increase in the sperm count was seen on administration of 300mg/kg, 500mg/kg for 28 days. The anti-infertility activity of CQ is ascribed to its restorative capacity to reduce the levels of lipid peroxidation and resotrre the ability of antioxidant enzymes such as SOD, CAT and GPx in tissues. However further clinical and molecular level studies would help comprehend the exact mechanism of action.

Anti-diabetic activity

According to WHO, there is a steady increase in the prevalence of diabetes over past decades. Nearly 422 milion people are diabetic and diabetes is the reason for about 1.5 million deaths every year. Hence a number of drugs and alternative medications are designed to combat diabetes. Plants possess various compounds that have significant effect in controlling diabetes. The phytochemicals influence multiple biological pathways and provide multifaceted benefits. CQ is reported to have role in regulating carbohydrate metabolism, cholesterol reduction, free radical elimination, insulin secretion and microcirculation improvement (Luo et al., 1998), all of which attribute to the anti-diabetic property of the plant.

Srivastava et al., has reported anti diabeteic property of ethyl acetate and hydro alcoholic extract of CQ in rats induced with diabetes using alloxan. After 72 hours of alloxan administration, a comparison of the average blood glucose level between the treated groups (the test group) and the untreated groups (the control group) of alloxan-induced diabetic rats suggests that CQ has some positive anti-diabetic effects. The CQ extracts appeared to have a similar mechanism of action to glibenclamide, in stimulating the ß-cell to produce more insulin, according to the results of the current experiment. A blood glucose lowering effect is of the plant is reported in obese human studies by Oben et al., in 2006, 2007. Further CQ is reported to rise insulin production and restore antioxidant enzymes in streptozotocin induced diabetic rats (Lekshmi et al., 2014) The free radical scavenging activity and positive regulation of insulin secretion by the flavonoids such kaempferol, quercitin and quercitrin contribute to the anti-diabetic property (Hussain et al., 2004; Jellin et al.,1999; Mousai et al., 2016; Bharti et al., 2018)

Anti-ulcer Activity

Stomach ulcers are soars that develop in the inner lining of stomach. It's mainly caused due to H.pyroli and non-steroidal anti-inflammatory drugs (NSAIDs), which hinders the stomach's mdefence against the acid produced for digestion. Owing to the richness of carotenoids, triterpenoids and antioxidants, CQ has been used from ancient times in the treatment of gastric disorders. The gastro protective activity of CQ has been reported by invivo studies involving mucosal damage induced by aspirin. (Szabo S et al., 1985; Jainu M et al., 2003; Anoop A. and Jagdeesan M, 2002). CQ reflected 40%, 71.2%, and 72.6% ulcer protection activity as compared to the standard drug ranitidine, when given in a dose of 250, 500, 750 mg/kg respectively for 7 days. It was also found to reverse the effects caused due to aspirin such as, increased lipid peroxidation, xanthine oxidase, and decrease in super

oxide dismutase, catalase and glutathione peroxidase (Levi S et al., 1990). It was also found to reduce DNA fragmentation by preventing oxidative damage of DNA. The cyto-protective activity of CQ is also demonstrated by its role in maintaining the levels of hexamine, potassium, bicarbonate and carbohydrate/ protein ratio with a decreased production of gastric content – pepsin, acid secretion (Austin and Jegadeesan, 2009). They have reported the stimulatory effect of CQ on cell growth, mucosal regeneration and angiogenesis through TGF-α promotion, proliferation of gastric epithelial and granulation of tissues in the test animal.

A dose dependent healing effect of CQ extract (CQE) was also supported by histoarchitecture in acetic acid (AA) treated rats. Additionally, ulcerated rats treated with CQE had considerably higher amounts of polyamines such putrescine, spermine, and spermidine as well as incorporation of 3H-thymidine. The extract reversed the alterations in the gastric mucosa of ulcerated rats with a considerable elevation in mitochondrial tricarboxylic acid (TCA) cycle enzymes and PCNA levels. The extract also provides gastroprotection in the ulcerated area by enhanced expression of TGF-a. These findings may confirm that CQE has a therapeutic effect on AA-induced gastric mucosal injury in rats (Jainu M et al., 2010).

The potential anti-ulcer property of the plant is also attributed to its anti H.pyroli activity as reported by Austin et al., 2003 and Austin et al., 2004. The chloroform extract of the plant has reported significant MIC and MLC values against H.pyroli, contributing further to its gastroprotective function.

Anti-microbial activity

According to literature, CQ has been used traditionally in the treatment of various bacterial and viral infections (Rao et al., 2007; Shah, 2011). The methanol extract of the plant reported high antibacterial activity against both gram positive as well as gram negative bacteria as compared to ether, acetone, petroleum, ethanol or ethyl acetate extracts (Kashikar and George, 2006) with a MIC of 0.465 for B. subtilis and S. aureus, 3.12 for P. aeurogenosa, 0.93 for S. pyogenes. Another study by Chenniappan et al (2020) reported effective antibacterial activity of ethanol as well as methanol extract of the plant against Escherichia, Klebsiella, Pasturella, Staphylococcus, and Aspergillus species at a dose of 100, 200, 300, 400 µg. Significat anti protozoal activity has also been reported against Entamoeba histolytica (Ramar K and Ayyadurai V, 2015; Rao B S and Deshpande V, 2005). Prominent antimicrobial activity is also reported by nanoparticles prepared from CQ (Marquis G et al., 2006). A study on antiviral activity of the stem of CQ by Balasubramanian et al., (2009) has reported significant activity against HSV type I and II. The antiviral activity of the extract is aspired to the immunomodulatory effect of Q. The antimicrobial activity of the plant against the above organisms may be attributed to the presence of various phytochemicals such as sterols, polyphenols, terpenoids, alkaloids, flavonoids, saponins, which inhibit microbal growth by various act by various mechanisms including, inhibition of EPI, inhibition urease and peptidoglycan thereby inhibiting cell wall (Maresso and Schneewind, 2008; Navarro-Martinez et al., 2005; Xiao et al., 2013), inhibition of enzymes such as carrier protein synthase (KAS II and III) (Khameneh et al., 2019) essential for bacterial membrane. All studies on antimicrobial activity highlight the significant role of the plant against common pathogens, still further study is recommended to to justify the antimicrobial effect of few extracts and lack in some with possible recommendations in dose or method.

Anti-haemorrhoid activity

Piles or haemorrhoid is characterised by painful swelling of veins in the lower rectum or anus, commonly affecting people in the age group of 45 to 65 years. In Thai, CQ is used as a traditional folklore medication for the treatmnet of piles. Studies reveal that the methanolic extract of CQ exhibit contraction of smooth muscles of veins at a dose of 0.1mg/ml, 0.2 mg/ml, 0.4mg/ml. The result obtained with 0.4mg/ml was in concordance with the standard drug ‘Daflon’ (Pathong et al., 2007). Similar result, reporting the veno-constrictive effect of CQ is also stated by Pirashahid et al., (2016) on the intact endothelium and denuded vein of rat. The possible mechanism behind the anti-haemorrhoidal activity is proposed as maintenance of capillary resistance and venous tonicity with reduction in capillary permeability that helps in reducing bleeding, itching and pain. The phytochemical flavonoid is suspected to be responsible for the above functions (Alonso-Coello et al., 2006; Danielsson et al., 2002; Fursa and Litvinenko, 1970; Veverkova et al., 2005) Smilarly tanins and terpenoids are also considered to be involved in reduction of haemorrhoidal disease as reported by Rahimi and Abdollahi (2013).

Anti-convulsant activity

A large amount of the global disease burden is accounted for by epilepsy, which affects about 50 million individuals globally, according to WHO. Between 4 and 10 per 1000 people are thought to be affected by active epilepsy at any given moment, defined as having on going seizures or needing treatment. Studies involving recovery of epilepsy in mice by using chemicals to induce epilepsy signify the effect of CQ in recovery from epilepsy and epileptic changes caused (Bum et al., 2008; Moto et al., 2018; Kumar et al., 2010). The ability of CQ in maintaining a balance between neuronal excitation and inhibition was reported by Moto et al., (2018) by proving its role in reduction of MDA and GABA-T and increases synthesis of GSH and GABA levels in mice. Neuro protection during epilepsy is also attributed to the presence of quercitin that functions by lowering ROS output, increasing the viability of hydrogen peroxide exposed neurons and prevention of apoptosis. Other phyto compounds such as, flavonoids, triterpenoids, ascorbic acid and phenolic compounds (Shirley and Sen et al., 1996; Enechi and Odonwodo, 2003; Saburi et al., 1999; Amos et al., 2001) are also reported to be responsible for the antiepileptic activity of CQ.

II. CONCLUSION

Traditional and ethnobotanical uses of natural substances, particularly those with plant origins, have drawn a lot of

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interest in recent years since they have undergone extensive efficacy testing and are widely regarded as safe for use by humans. They undoubtedly merit examination along contemporary scientific lines, including phytochemical research, biological testing on experimental animals, toxicity studies, analysis of the molecular mechanisms behind isolated phytoprinciples' actions, and their clinical trials.

CQL is a climbing herb that is also referred to as Hadjod and Asthisamadhani in India and has long been used to treat a variety of ailments. It may be grown in plain coastal regions, jungles, and wastelands up to 500 m elevation and is present across India's warmest regions. Traditional medicine has employed various portions of CQL, including the stem, root, and leaves, to cure a variety of ailments, including piles, blindness, tumors, muscular discomfort, vata and kapha, loss of appetite, epileptic fits, constipation, chronic ulcers, and bone fractures. Despite being well-known for its antiosteoporotic properties, CQL also showed a wide range of therapeutic possibilities. The majority of the published research focused on various extracts made from various plant sections, which revealed a variety of pharmacological effects.
In animal experiments, CQL demonstrated its biological potential against a variety of serious and persistent diseases, and numerous research have indicated the potential for anti-cancer, analgesic, and anti-inflammatory actions. Additionally, more than 46 isolated and identified chemicals from various CQL sections, including flavonoids, alkaloids, terpenes, iridoids, steroids, glycosides, etc., were also revealed in published data. Considered to be significant CQL ingredients, quercetin, kaempferol, resveratrol, luteolin, -sitosterol, and friedelin have therapeutic promise as analgesics, antidiabetics, antiulcer, anticancer, anti-inflammatory, and estrogenic agents. Furthermore, because relatively few compounds from the herb were extracted, there is a significant chance that the plant will provide additional, undiscovered phytochemicals that can be isolated and identified.

Majority of biological activities exclusively use the herb's ethanolic and methanolic extracts at various concentrations to demonstrate its medicinal potential. Therefore, future plans for the herb's pharmacological studies should make use of different extracts. To support the herb's claimed biological potential and justify its use in the future, biological research focusing on bioguided isolation, pharmacokinetics, and associated pharmacological effect as well as its molecular mechanism must be included. Numerous in vitro and in vivo investigations supported some of the herb's traditional uses. However, the effectiveness of this claim in treating piles, blindness, constipation, eye problems, insect bites, epistaxis, leprosy, and skin conditions has to be supported by current scientific methodology. In conclusion, and based on our evaluation of the literature, we expect that the current overview of CQL will act as a starting point for upcoming research on this herb.

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