3. REVIEW OF LITERATURE

3.1 MEDICINAL PLANTS

Medicinal plants have always been the principle source of medicine in India since ancient past and presently they are becoming popular throughout the developed countries. Besides, they also play an important role in the lives of tribal and rural people, particularly in remote part of developing countries. Obviously, these plants help in alleviating human suffering. These plants are being integrated to the field of foods as additives, beverage and cosmetics. There has been a rapid extension of allopathic system of medical treatment in our country during the past century. However, these drugs have adverse effect on human health and people are going back to nature with hope of safety and security. One the other hand, the drug obtained from the medicinal plants are safe, cheaper, easily available and with no fear of any side effects. Moreover, these are more compatible the human body constitution and suits to the local and cultural need of the people. The indigenous method of preparation maintains the purity of the drug. Furthermore, traditional folk healers treat with kindness, grace, patience and tolerance, which play a vital role in healing process today.

Medicinal plants generated commercial demand for pharmacopoeial drugs and their products in India. Efforts have been made in recent years to introduce many of these drug plants to common people. The agronomical practices for growing few medicinal plants have been developed and there is now localized cultivation of these medicinal plants commercially in many part of our country.

It is evident that many valuable herbal drugs have been discovered by knowing that a particular plant was used by the ancient folk healers for the treatment of some kind of ailments. Moreover, the medicinal plant wealth are our national heritage and it seems to be the first and foremost line of defence for the treatment of various diseases mostly tribal and rural communities and is a worth scientific study.
The urgent need of hour is the evolution of an action plan for spreading awareness about the value and importance of medicinal plants. In addition to curing various ailments, these plants will add to the national needs export potential. We have to link the indigenous traditional knowledge with modern technology. With the coming of chemical revolution, the medicinal plants, which were once used by the primitive folk healers and traditional medicine men, have found wide acceptance and a place of pride in the modern system of medicine. Their chemical examination revealed that they possess chemical compounds of great biological activity. Indeed, these plants are capable to cure some incurable diseases and also cure the diseases from root. People suffering from chronic diseases and after loosing all hops from allopathic medicine, turn their eyes towards herbal medicine. The add advantage is that the medicinal plants are easily available, cheaper and without any side effect. Hence, the prime need is to make uses of medicinal plants for solving the health problem and major ailments of the people.

Keeping this point in consideration about the utilization and medicinal value of the plants the following plants were plant for present investigation. After the comprehensive literature review the following work done has been found to be already carried which are presented below.

**Abutilon muticum**

Yasmin *et al.*, 2010 studied Antioxidant potential and radical scavenging effects of various extracts from *Abutilon indicum* and *Abutilon muticum*. *Abutilon indicum* L. (Malvaceae) and *Abutilon muticum* DC. (Malvaceae) are traditional medicinal herbs used for analgesic, anthelmintic, hepatoprotective, and hypoglycemic properties. These effects may be correlated with the presence of antioxidant compounds. Extracts in organic solvents from the aerial parts and roots of both species were prepared and evaluated for their total antioxidant capacity (TAC), total phenolic content, and total flavonoid content. The Trolox equivalent antioxidant capacity (TEAC) of all the extracts of both plants was found, employing ABTS and FRAP assays. TEAC values ranged from 3.019 to 10.5 μM for n-hexane and butanol fractions of *Abutilon indicum* and from 2.247 to 14.208 μM for n-hexane and butanol fractions of *Abutilon muticum*, respectively, using the ABTS assay. The FRAP assay showed reducing powers of the fractions in the order of butanol > ethyl acetate >
chloroform > n-hexane and butanol > chloroform > hexane > ethyl acetate for Abutilon indicum and Abutilon muticum, respectively. EC(50) and T(EC50) values for the extracts of both plants were determined using the DPPH free radical assay. The reaction kinetics with this free radical indicated the presence of both slow reacting and fast reacting antioxidant components in the extracts of both plants. The antioxidant/radical scavenging capacity of the extracts was found to be a dose-dependent activity. The results obtained in the present study indicate that both Abutilon species are potential sources of natural antioxidants.

Bhajipale 2010 studied Effect of *Abutilon muticum* in Albino Rats by Swim Endurance Test. Methanolic extract of seed of Abutilon muticum was investigated on anti-stress activity in whister Albino Rats. The animals were subjected to acute physical stress (swim endurance stress model) to gauze anti-stress potential of the extract. Stimulation of hypothalamus pituitary adrenal axis in stressful condition alters plasma glucose, cholesterol, triglycerides. There is also alteration in blood cells counts. Pretreatment with extract significantly ameliorate the stress induced variations in these biochemical levels and blood cell counts in acute stress models. The results in present research indicate that methanolic extract of Abutilon muticum extract has significant adaptogenic activity against a variety of biochemical and physiological perturbations in stress models.

Chakraborty and Ghorpade 2010 studied free radical scavenging activity of *Abutilon indicum* (Linn.) sweet stem extracts, currently, there has been an increased interest globally to identify antioxidant compounds that are pharmacologically potent and have low or no side effects for use in preventive medicine. Antioxidant compounds in food play an important role as a health-protecting factor and it neutralizes the free radicals, which are unstable molecules and are linked with the development of a number of degenerative diseases and conditions including hepatic disease, immune dysfunction, cataracts and macular degeneration. Scientific evidence suggests that antioxidants reduce the risk for chronic diseases and conditions. Antioxidant compounds like phenolic acids, polyphenols and flavonoids scavenge free radicals.
such as peroxide; hydroperoxide or lipid peroxyl which are thereby involved in reducing the risk of diseases associated with oxidative stress. Thus in the present study an attempt was made to determination the Total Phenolic Content (TPC), quantified by Folin–Ciocalteu method and free radical scavenging (antioxidant) activity by DPPH (2, 2-diphenyl-1 picryl hydrazyl) in methanolic (AIM), Hydro-alcoholic (AIHA) and aqueous (AIA) extracts of the Abutilon indicum Stem. The TPC and percentage inhibition of DPPH radical were calculated and respectively. Thus it could be concluded that the AIA showed a potent total phenolic content and possessed a significant scavenging activity.

*Celosia argenta* 

Malomo et al., 2011 investigated *In vitro* and *in vivo* antioxidant activities of the aqueous extract of *Celosia argentea* leaves. The aqueous extract of *Celosia argentea* var. *cristata* L. leaves at 100, 200, and 400 mg/kg body weight (b.w.) was investigated against cadmium (Cd)-induced oxidative stress in Wistar rats. The *in vitro* antioxidant of the extract was evaluated using ammonium thiocyanate, reducing power, and membrane stabilizing models. For the *in vivo* study, 30 male rats (*Rattus norvegicus*) weighing 138.02 ± 7.02 g were completely randomized into 6 groups (A-F) of 5 animals each. Animals in groups A and B received 0.5 ml of distilled water and the same volume containing 8 mg/kg b.w. of Cd, respectively, for 7 days orally. Animals in groups C, D, E, and F were treated like those in group B except that they received 100 mg/kg b.w. of ascorbic acid, and 100, 200, and 400 mg/kg b.w. of the extract, respectively, in addition to Cd. Phytochemical screening revealed the presence of alkaloids (0.61%), saponins (2.93%), cardiac glycosides (0.21%), cardenolides (0.20%), phenolics (3.26%), and flavonoids (2.38%). A total of 10 mg/ml of the extract inhibited linoleic acid oxidation by 67.57%. The highest reducing power was 100 mg/ml as against 10 mg/ml for ascorbic acid. In addition, 2 mg/ml of the extract produced a membrane stabilizing activity of 63.49% as against 77.46% for indomethacin. Compared with the distilled water control group, the administration of Cd alone significantly (*P* < 0.05) decreased the alkaline phosphatase activity of the rat liver and brain. This decrease was accompanied by a corresponding increase in the serum enzyme. The simultaneous administration of the extract and Cd produced an enzyme activity that compared favorably (*P* > 0.05) with the animals that received Cd and ascorbic acid. In addition, the reduction in the superoxide dismutase
and catalase activity of the liver and brain of the animals, serum uric acid, albumin and bilirubin, and also the increase in the serum malondialdehyde content in animals treated with Cd alone was attenuated by the extract; the values compared well (\(P > 0.05\)) with those simultaneously administered with Cd and ascorbic acid. Overall, the results indicated that the aqueous extract of \textit{C. argentea} leaves attenuated Cd-induced oxidative stress in the animals, with the best result at 400 mg/kg b.w. The antioxidant activity of the extract may be attributed to the phenolic and flavonoid components of the extract. The induction of antioxidant enzymes and scavenging of free radicals may account for the mechanism of action of the extract as an antioxidant.

\textbf{Wu et al., 2011} studied triterpenoid saponins from the seeds of \textit{Celosia argentea} and their anti-inflammatory and antitumor activities. Three new triterpenoid saponins, named celosin E (1), celosin F (2) and celosin G (3), together with a known compound cristatain (4), were isolated from the seeds of \textit{Celosia argentea} L. (Amaranthaceae). All the isolated compounds were obtained for the first time from this plant. The structures of new compounds were characterized on the basis of extensive NMR experiments and mass spectrometry data. The antitumor and anti-inflammatory activities of the four compounds were tested in vitro.

\textbf{Priya et al., 2004} investigated \textit{Celosia argentea} Linn. leaf extract improves wound healing in a rat burn wound model. \textit{Celosia argentea} (CA) is used in traditional medicine for sores, ulcers, and skin eruptions. The present study was aimed at investigating the healing efficacy of CA extract in an ointment formulated (10 % w/w) as an alcohol extract of CA using a rat burn wound model. Wound closure occurred earlier in the treated rats (15 days vs. 30 in the untreated group; \(p < 0.05\)). Granulation tissue collected on every fifth day of healing showed an increase in collagen and hexosamine content at a faster rate in the treated wounds. This correlated with the accelerated wound closure observed in the treated groups. To probe the cellular basis of this effect, we investigated the effect of this extract on two major cellular responses; cell proliferation and cell motility, in two key cell lineages, fibroblasts and keratinocytes. CA was not toxic at concentrations of < 3 microg/ml in fibroblasts and < 30 microg/ml in keratinocytes. The alcohol extract promoted cell motility and proliferation of primary dermal fibroblasts at 0.1-1.0 microg/ml but did not alter these responses in primary keratinocytes. In an initial examination of molecular
mechanisms, we found that the CA extract did not alter fibroblast and keratinocyte responses to the wound repair-associated epidermal growth factor receptor ligands. In short, we demonstrate a salutary action of the CA extract on wound healing, and suggest that this may be due to mitogenic and motogenic promotion of dermal fibrobl.

Sharma et al., 2010 investigated Antidiarrhoeal activity of leaf extract of celosia argentea in experimentally induced diarrhoea in rats. In order to scientifically apprise some of the anecdotal, folkloric, ethno medical uses of celosia argentea, the present study was undertaken to examine the antidiarrhoeal properties of alcoholic extract of leaves of Celosia argentea on diarrhoea by using different experimental models. Anti-diarrhoeal effect was evaluated by castor oil induced diarrhoea, charcoal meal test and PGE(2) induced diarrhoea. Loperamide (2 mg/kg) and atropine (0.1mg/kg) were used as standard drugs. Extract was used in 100 and 200 mg/kg dose. It produced dose related anti-diarrhoeal effect. Results suggest that it may act centrally and may inhibit the PGE(2) to give anti-diarrhoeal effects. Result of charcoal meal test also suggests its anti-muscarinic activity.

Gnanamani et al., 2003 studied Antibacterial activity of two plant extracts on eight burn pathogens. Antibacterial activity of crude alcoholic extract of Datura alba and Celosia argentea leaves were studied against pathogens isolated from infected burn patients. The disc-diffusion method showed significant zone of lysis against all the pathogens studied and the results are comparable to the conventional antibiotic cream namely Silver Sulphadiazine (SSD). On comparing the efficiency of the two extracts, extract of D. alba exhibited more than 50% increase in antibacterial activity compared to C. argentea.

Schliemann et al., 2001 studied Betalains of Celosia argentea. The betalains of yellow, orange and red inflorescences of common cockscomb (Celosia argentea var. cristata) were compared and proved to be qualitatively identical to those of feathered amaranth (Celosia argentea var. plumosa). In addition to the known compounds amaranthin and betalamic acid, the structures of three yellow pigments were elucidated to be immonium conjugates of betalamic acid with dopamine, 3-methoxytyramine and (S)-tryptophan by various spectroscopic techniques and comparison to synthesized reference compounds;
the latter two are new to plants. Among the betacyanins occurring in yellow inflorescences in trace amounts, the presence of 2-descarboxy-betanidin, a dopamine-derived betacyanin, has been ascertained. The detection of high dopamine concentration may be of toxicological relevance in use of yellow inflorescences as a vegetable and in traditional Chinese medicine, common uses for the red inflorescences of common cockscomb.

Ghule et al., 2010 studied Anti-diabetic activity of Celosia argentea root in streptozotocin-induced diabetic rats. The study was designed to investigate the anti-diabetic hypoglycaemic properties of an ethanolic extract of the root of Celosia argentea which is widely used in India as a traditional treatment for diabetes mellitus. An ethanolic extract of C. argentea root was found to lower blood glucose in basal conditions and after a heavy glucose load in normal rats. Maximum reduction in serum glucose was observed after 90 minutes at a dose of 500 mg/kg (63.28%) of body weight, but petroleum ether and chloroform extracts (8.52% and 9.81%, respectively) did not reduce the serum glucose. Ethanolic extract of C. argentea was also found to reduce the increase of blood sugar found in streptozotocin-induced diabetic rats (73.43% at 250 mg/kg and 80.20% at 500 mg/kg body weight on 15th day). Chronic administration of the extract significantly reduced the blood sugar in streptozotocin-induced diabetic rats for several days (15 days). The ethanolic extract was also found to reduce the increased levels of cholesterol, triglycerides and urea. The extract also restored the decreased level of proteins and liver glycogen in streptozotocin-induced diabetic animals and inhibited the body weight reduction induced by streptozotocin administration. These results indicate that C. argentea root extracts are able to ameliorate biochemical damages induced by streptozotocin in diabetic rats.

* Crotalaria burhia  

Kataria et al. 2011 studied the pharmacognostical evaluation of Crotalaria burhia Buch. Ham. In this study they investigated various pharmacognostical standards like organoleptic, microscopic, physicochemical, fluorescence study, phytochemical screening and chromatographic study were reported.

* Salvadora persica  


Al-Sohaibani and Murugan 2012 studied the Anti-biofilm activity of *Salvadora persica* on cariogenic isolates of Streptococcus mutans: *In Vitro* and molecular docking studies. In the present investigation it was found that *Salvadora persica* sticks are used for chewing and oral-hygiene measures worldwide. The growth inhibition and anti-biofilm effects of various extracts on cariogenic *Streptococcus* mutans isolates were evaluated. Biofilm inhibition, gas chromatography-mass spectrometry (GC-MS) analyses for phytochemicals and their possible mode of interaction with biofilm response regulators were revealed using LigandFit docking protocols. All *S. persica* extracts showed considerable inhibitory activity and the cariogenic *S. mutans* showed varied susceptibility when compared with controls. The percentage reduction in biofilm inhibition obtained for methanol, ethanol, chloroform, acetone, and aqueous extracts were 87.92%, 85.75%, 72.44%, 61.66% and 58.68%, respectively. GC-MS analyses revealed >28 compounds, of which benzyl (6Z, 9Z, 12Z)-6, 9, 12-octadecatrienoate, 3-benzyloxy-1-nitro-butan-2-ol and 1,3-cyclohexane dicarbohydrazide interacted efficiently with the bacterial communication quorum-sensing (QS) regulators *Streptococcus Omp P* and *Staphylococcus Lux* proteins. The bioactive, dual-function, anti-biofilm agents in *S. persica* not only inhibit growth, but also control the colonization and accumulation of caries-causing *S. mutans*.

Sofrata et al., 2011 studied Benzyl isothiocyanate, a major component from the roots of *Salvadora persica* is highly active against Gram-negative bacteria and state that plants produce a number of antimicrobial substances and the roots of the shrub *Salvadora persica* have been demonstrated to possess antimicrobial activity. Sticks from the roots of *S. persica*, Miswak sticks, have been used for centuries as a traditional method of cleaning teeth. Diverging reports on the chemical nature and antimicrobial repertoire of the chewing sticks from *S. persica* led us to explore its antibacterial properties against a panel of pathogenic or commensal bacteria and to identify the antibacterial component/s by methodical chemical characterization. *S. persica* root essential oil was prepared by steam distillation and solid-phase microextraction was used to sample volatiles released from fresh root. The active compound was identified by gas chromatography-mass spectrometry and antibacterial assays. The antibacterial compound was isolated using medium-pressure liquid chromatography. Transmission electron microscopy was used to visualize the effect
on bacterial cells. The main antibacterial component of both S. persica root extracts and volatiles was benzyl isothiocyanate. Root extracts as well as commercial synthetic benzyl isothiocyanate exhibited rapid and strong bactericidal effect against oral pathogens involved in periodontal disease as well as against other Gram-negative bacteria, while Gram-positive bacteria mainly displayed growth inhibition or remained unaffected. The short exposure needed to obtain bactericidal effect implies that the chewing sticks and the essential oil may have a specific role in treatment of periodontal disease in reducing Gram-negative periodontal pathogens. Our results indicate the need for further investigation into the mechanism of the specific killing of Gram-negative bacteria by S. persica root stick extracts and its active component benzyl isothiocyanate.

Sofrata et al., 2011 studied Short term clinical effect of active and inactive Salvadora persica miswak on dental plaque and gingivitis. Salvadora persica shrub has been used traditionally in folk medicine for different medical condition treatments. The habitual use of Salvadora persica roots (chewing sticks) for dental hygiene is still wildly spread throughout parts of Asia, Africa, and Middle. It is one of the most important species with its reported strong antibacterial, antifungal, and antiviral effects. Mechanical removal of dental plaque is regarded as an effective means of controlling progression of periodontal disease. In this double blinded randomized controlled trial 68 gingivitis patients were randomly assigned to either active or inactive miswak group, and were instructed to use only issued miswaks for oral hygiene during 3 weeks experimental period. Registration of plaque, gingival inflammation, and plaque samples were taken at baseline and on completion of the study. Plaque samples were analyzed by DNA-DNA hybridization technique. Active miswak significantly reduced dental plaque (p = 0.007). There were no differences between active and inactive miswak in reduction of approximal plaque and composition of subgingival microbiota. Miswak has an overall effect on dental plaque and gingival inflammation scores. Similar results were achieved by active and inactive miswak in difficult to reach areas, indicating miswak has limited chemical effects on this study population. Therefore, miswak can be used as a dental hygiene method in conjunction with interproximal cleaning aides.

Geetha et al., 2010 investigated Control of urinary risk factors of stone formation by Salvadora persica in experimental hyperoxaluria. Urolithiasis, the process of
formation of stones in the kidneys and urinary tract, is the major clinical manifestation of hyperoxaluria. Ethylene glycol feeding resulted in hyperoxaluria with increased renal excretion of oxalate, sodium, calcium and phosphate and a decrease in the excretion of magnesium. Supplementation with an aqueous and alcoholic extract of the leaves of Salvadora persica significantly reduced elevated urinary oxalate levels, indicating a regenerative action on endogenous oxalate synthesis. The deposition of stone-forming constituents in the kidneys of calculogenic rats was also significantly lowered by curative and preventive treatments with the aqueous and alcoholic extracts of Salvadora persica. The high serum creatinine level observed in ethylene glycol-treated rats was also reduced following treatment with the extracts. Histopathological findings showed signs of improvement after treatment with the extracts. These observations led to the conclusion that the aqueous and alcoholic extracts of the leaves of Salvadora persica are endowed with antiurolithiatic properties.

Noumi et al., 2010 reported Antifungal properties of Salvadora persica and Juglans regia L. extracts against oral Candida strains. They reported for the first time, the potent antifungal activities of Salvadora persica and Juglans regia L. on different Candida species. Methanol, ethyl acetate, and diluted acetone extracts of S. persica (fresh and dry plant) and J. regia L. were screened for in vitro activity against some Candida species. These plants were selected due to their traditional use for the treatment of oral infections. Plant preparations were screened for antifungal activity using a standard agar disc diffusion assay. Following study of the antifungal activity of plant extracts, their minimal inhibitory concentration (MIC) and minimal fungicidal concentration (MFC) values were determined using broth microdilution assay. Among S. persica and J. regia L. extracts, ethyl acetate J. regia L. extract had potent antifungal activity against all Candida strains. The MIC values of the J. regia L. against Candida strains ranged from 0.006 to 0.195 mg/ml. Two C. albicans strains showed a high MIC value (3.125 mg/ml). These results indicate that extracts can contain compounds with therapeutic potential against Candida strains and, hence, their possible use as therapeutic agents.

Almas 2002 investigated the effect of Salvadora persica extract (miswak) and chlorhexidine gluconate on human dentin: a SEM study. Bacterial plaque is solely responsible for the initiation and progression of periodontal diseases. There are different mechanical and chemical methods available for the maintenance of oral
health through plaque control. Toothbrushes and miswak (chewing sticks) are widely used for the mechanical removal of plaque. Chlorhexidine gluconate (CHX) is one of the best-proven anti-plaque agents. The aim of this study was to evaluate the effects of CHX and miswak extract on healthy and periodontally involved human dentin. Sixteen human premolars recently extracted for orthodontic and periodontal reasons were used in the study. Teeth were free from caries, cervical restorations, or erosions. The dentin disc specimens were prepared and half of them were etched with 6% citric acid for 120 sec. Both etched and unetched were further treated with CHX and 50% miswak extract and prepared for Scanning Electron Microscopic (SEM) examination. It was concluded that CHX 0.2% and miswak extract 50% had a similar effect on dentin in the control group. Miswak extract removed more smear layer as compared to CHX. Further research is needed in vivo to compare the effects of CHX and miswak extract on periodontally involved teeth and teeth with dentinal hypersensitivity.

*Salvadora oleoides*<sup>285</sup>

Yadav *et al.*, 2008 find out the hypoglycemic and hypolipidemic activity of an ethanolic extract of the aerial part of *Salvadora oleoides* Decne in euglycemic and alloxan-induced diabetic albino rats. Diabetes was induced in albino rats by administration of alloxan monohydrate (120 mg/kg, i.p.). Normal as well as diabetic albino rats were divided into groups (*n* = 6) receiving different treatments: vehicle (control), ethanolic extract (1 g and 2 g/kg b.w), and standard antidiabetic drug tolbutamide (0.5 g/kg b.w.). Blood samples were collected by cardiac puncture and were analyzed for blood glucose and lipid profile on days 0, 7, 14, and 21. The ethanolic extract of *S oleoides* produced significant reduction (*P* < 0.001) in blood glucose and also had beneficial effects (*P* < 0.001) on the lipid profile in euglycemic as well as alloxan-induced diabetic rats at the end of the treatment period (21<sup>st</sup> day). However, the reduction in the blood glucose and improvement in lipid profile was less than that achieved with the standard drug tolbutamide. They concluded that an ethanolic extract of *S oleoides* is effective in controlling blood glucose levels and improves lipid profile in euglycemic as well as diabetic rats.