Chapter 3

REVIEW OF LITERATURE
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- **A. K. Azad Khan et al., (1980)** conducted double-blind controlled trial using the leaves of the *Coccinia indica* to treat patients with untreated but uncomplicated maturity-onset diabetes and the findings of the this study showed that the leaves of *C. indica* may be useful for the oral treatment of patients with maturity-onset diabetes mellitus, especially as there were no adverse effects during six weeks of use.\(^{122}\)

- **Baizid A. Shibib et al., (1993)** evaluated the hypoglycemic activity of 60% ethanolic extract of leaves of *Coccinia indica* and 95% ethanolic extract of *Momordica charantia* in diabetic rats and the results of the study indicate that *Coccinia indica* and *Momordica charantia* extracts lowered blood glucose by depressing its synthesis, on the one hand through depression of the key gluconeogenic enzymes glucose-6-phosphatase and fructose-1,6-bisphosphatase and on the other by enhancing glucose oxidation by the shunt pathway through activation of its principal enzyme glucose-6-phosphate dehydrogenase (G6PDH).\(^{123}\)

- **Pulok K. Mukherjee et al., (1995)** evaluated the effects of methanolic extract of rhizomes of *Nelumbo nucifera* Gaertn for its antidiarrhoeal potential against several experimental models of diarrhoea in rats and reported significant antidiarrhoeal activity of methanolic extract of rhizomes of *Nelumbo nucifera* Gaertn.\(^{124}\)

- **Pulok K. Mukherjee et al., (1997)** investigated the effect of *Nelumbo nucifera* rhizome extract on blood sugar level in rats and found that Oral administration of the ethanolic extract of rhizomes of *Nelumbo nucifera* markedly reduced the blood sugar level of normal, glucose-fed hyperglycemic and streptozotocin-induced diabetic rats.\(^{125}\)
• **Y. Hayakawa *et al.*, (1998) investigated the anti-metastatic effect of *Celosia argentea* seed extracts, which have traditionally been used as a therapeutic drug for eye and hepatic diseases in China and Japan and concluded that the anti-metastatic effect by *Celosia argentea* seed extracts is based on its immunomodulating properties.\(^{126}\)

• **Hiroshi Morita *et al.*, (2000) studied antimitotic activity of moroidin, a bicyclic peptide from the seeds of *Celosia argentea* and found that moroidin remarkably inhibited the polymerization of tubulin. The inhibitory activity the tubulin polymerization by moroidin was more potent than that of colchicine.\(^{127}\)

• **K. Srinivas *et al.*, (2000) studied the anti-inflammatory effect of *Heliotropium indicum*, and *Leucas aspera* on carrageenan induced hind paw oedema and cotton pellet granuloma in rats and concluded that *H. indicum* and *L. aspera* possess anti-inflammatory effects in both acute and subacute inflammation.\(^{128}\)

• **Sanghamitra Sinha *et al.*, (2000) investigated antipyretic potential of *Nelumbo nucifera* stalk extract and concluded that ethanol extract of stalks of *Nelumbo nucifera* (NNSE) was evaluated for its antipyretic potential on normal body temperature and yeast induced pyrexia in rats. NNSE showed significant activity in both the models at oral doses of 200 and 400 mg/kg. NNSE at a dose of 200 mg/kg was found to produce significant lowering of normal body temperature up to 3 h and at 400 mg/kg it caused significant lowering of body temperature up to 6 h after its administration.\(^{129}\)

• **S. Ghasi *et al.*, (2000) investigated hypocholesterolemic effects of crude extract of leaf of *Moringa oleifera* Lam in high-fat diet fed wistar rats and found that leaves of *M. oleifera* have definite hypocholesterolemic activity and there is valid pharmacological basis for employing them for this purpose in India.\(^{130}\)
• **S. W. Hajare et al., (2000)** evaluated analgesic and antipyretic activities of *Dalbergia sissoo* leaves using acetic acid-induced writhing in mice and by Randall-Selitto assay and reported that leaves of *D. sissoo* have analgesic and antipyretic activities.\(^{131}\)

• **Salwa F. Farag et al., (2001)** isolated two isoflavone glycosides, biochanin A 7-O-[β-d-apiofuranosyl-(1→5)-β-d-apiofuranosyl-(1→6)-β-d-glucopyranoside] and tectorigenin 7-O-[β-d-apiofuranosyl-(1→6)-β-d-glucopyranoside], were isolated from *Dalbergia sissoo*.\(^{132}\)

• **S. W. Hajare et al., (2001)** evaluated anti-inflammatory activity of 90% ethanolic extract of *Dalbergia sissoo* leaves in different models of inflammation in rats after oral administration at doses of 100, 300 and 1000 mg/kg and concluded that the *D. sissoo* leaf extract possessed significant anti-inflammatory activity (in acute, sub-acute and chronic models of inflammation) without any side effect on gastric mucosa.\(^{133}\)

• **V. Gopalakrishnan et al., (2001)** evaluated the antihepatotoxic activity of aqueous, light petroleum, chloroform, alcohol, benzene and acetone extracts of the leaves of *Coccinia indica* and the results of the study showed that alcohol and light petroleum extracts have good anti-hepatotoxic activity.\(^{134}\)

• **J. K. Grover et al., (2002)** reviewed the some Indian medicinal plants which are most effective and the most commonly studied in relation to diabetes and their complications are: *Allium cepa, Allium sativum, Aloe vera, Cajanus cajan*, *Coccinia indica*, *Caesalpinia bonducella*, *Ficus bengalenesis*, *Gymnema sylvestre*, *Momordica charantia*, *Ocimum sanctum*, *Pterocarpus marsupium*, *Swertia chirayita*, *Syzygium cumini*, *Tinospora cordifolia* and *Trigonella foenum graecum* and stated that aqueous and alcoholic extract of *Caesalpinia bonducella* seeds exhibited significant hypoglycemic and anti-hyperglycemic activities in normal and STZ hyperglycemic rats.\(^{135}\)
• **Thangarasu Vetrichelvan et al., (2002)** evaluated the effect of an alcoholic extract of *Celosia argentea* seeds on blood glucose and body weight in alloxan-induced diabetic rats and reported that extract possesses anti-diabetic activity in alloxan-induced diabetic rats.¹¹⁴

• **Ajit Kar et al., (2003)** have been selected 30 hypoglycemic medicinal plants for thorough studies from indigenous folk medicines, Ayurvedic, Unani and Siddha systems of medicines. All the herbal samples (vacuum dried 95% ethanolic extracts) have definite blood glucose lowering effect within 2 weeks have been confirmed in alloxan diabetic albino rats. While evaluating comparative hypoglycemic activity of the 24 experimental herbal samples, *Coccinia indica* extract showed maximum hypoglycemic activity.¹³⁶

• **Arumugam Gnanamani et al., (2003)** examined the 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. On comparing the efficiency of the two extracts, extract of *D. alba* exhibited more than 50% increase in antibacterial activity compared to *C. argentea*.¹³⁷

• **Rajni Goyal et al., (2003)** evaluated the influence of unripe fruit of *Capparis decidua* on human plasma triglycerides, total lipids and phospholipids. The diet of 15 hyperlipidemic adults (40–60 years) was supplemented with teent (unripe fruit of *Capparis decidua*) for three months and plasma triglycerides, total lipids and phospholipids were analysed before and at the end of the experiment. Significant reductions in plasma triglycerides, total lipids and phospholipids concentration were noticed.¹³⁸
• Ilhami Gulcin et al., (2004) evaluated the in vitro antioxidant capacity of morphine using different antioxidant tests, including total antioxidant activity, reducing power, free radical scavenging, superoxide anion radical scavenging, hydrogen peroxide scavenging and metal chelating activities and the results of the study indicates strong total antioxidant activity of morphine.\textsuperscript{139}

• Kulasekaran S. Priya et al., (2004) investigated the healing efficacy of Celosia argentea Linn. leaf extract in an ointment formulated (10 % w/w) as an alcohol extract of Celosia argentea using a rat burn wound model and reported a salutary action of the Celosia argentea extract on wound healing, and suggest that this may be due to mitogenic and motogenic promotion of dermal fibroblasts.\textsuperscript{140}

• Ashok Purohit et al., (2005) investigated the hypolipidaemic efficacy of Capparis decidua fruit and shoot extracts in cholesterol fed rabbits and the results of the experiment indicates hypolipidaemic potential of Capparis decidua fruit and shoot.\textsuperscript{141}

• Ilhami Gulcin et al., (2005) investigated the antioxidant activity of total anthocyanins from Perilla pankinensis samples (TAPP) by different analytical methods: 1,1-diphenyl-2-picrylhydrazyl (DPPH•) free radical scavenging, total antioxidant activity, total reducing activity, superoxide anion radical scavenging, hydrogen peroxide scavenging and metal chelating activities. TAPP have found effective on DPPH• scavenging, superoxide anion radical and hydrogen peroxide scavenging, total reducing power and metal chelating on ferrous ions activities.\textsuperscript{142}

• K. Mangathayaru et al., (2005) evaluated the methanol extract of Leucas aspera flowers, its fractions, the alkaloidal residue and the expressed flower juice for antimicrobial activity and found good antibacterial activity for methanol extract and methanol fraction with maximum activity for the alkaloidal residue.\textsuperscript{143}
• **Yoshiki Kashiwada et al., (2005)** reported and isolated benzylisoquinoline alkaloids and flavonoids having anti-HIV activity from the leaves of *Nelumbo nucifera.*

• **B. S. Rathi et al., (2006)** investigated aqueous extract of leaves of *M. oleifera* for its wound healing activity. The aqueous extract was studied at dose level of 300 mg/kg body weight using resutured incision; excision and dead space wound models in rats. Significant increase in wound closure rate, skin-breaking strength, granuloma breaking strength, hydroxyproline content, granuloma dry weight and decrease in scar area was observed. From the results obtained, it may be concluded that the aqueous extract of *M. oleifera* has significant wound healing property.

• **D. Venkat Ratnam et al., (2006)** reviewed the role of antioxidants in prophylaxis and therapy. Free radicals have been associated with pathogenesis of various disorders like cancer, diabetes, cardiovascular diseases, autoimmune diseases, neurodegenerative disorders and are implicated in aging. Several antioxidants like SOD, CAT, epigallocatechin-3-O-gallate, lycopene, ellagic acid, coenzyme Q10, indole-3-carbinol, genistein, quercetin, vitamin C and vitamin E have been found to be pharmacologically active as prophylactic and therapeutic agents for above mentioned diseases.

• **Francesca Borrelli et al, (2006)** investigated the effect and the mode of action of *Boswellia serrata* extract (BSE) on intestinal motility, both in vitro and in vivo and concluded that BSE directly inhibits intestinal motility with a mechanism involving L-type Ca\(^{2+}\) channels. BSE prevents diarrhoea and normalizes intestinal motility in pathophysiological states without slowing the rate of transit in control animals. These results could explain, at least in part, the clinical efficacy of this Ayurvedic remedy in reducing diarrhoea in patients with inflammatory bowel disease.
- **L. P. Awasthi et al., (2006)** reviewed the medicinal importance of *Boerhavia Diffusa Linn*. Along with immunomodulatory, antimicrobial anti-inflammatory activities etc., the authors observed potent antiviral efficacy of this plant against phytopathogenic viruses. The antiviral agent isolated from this plant was found to be a glycoprotein with a molecular weight of 16-20 kDa. Administered by foliar spraying in the field, this antiviral agent could protect some economically important crops against natural infection by plant viruses.\textsuperscript{148}

- **Sujay Rai et al., (2006)** evaluated the antioxidant activity of hydro alcoholic extract of *Nelumbo nucifera* seeds using in vitro and in vivo models and reported significant antioxidant nature of hydro alcoholic extract of *Nelumbo nucifera* seeds.\textsuperscript{121}

- **S. Brijesh et al., (2006)** Studied leaves of *Dalbergia sissoo* (Roxb.) for possible mechanism(s) of action in infectious diarrhoea and reported that *D. sissoo* is antidiarrhoeal as it affects bacterial virulence but it has no antimicrobial activity.\textsuperscript{116}

- **Yuka Ono et al., (2006)** examined the anti-obesity effect of *Nelumbo nucifera* leaves extract in mice and rats and reported that *Nelumbo nucifera* leaves extract is beneficial for the suppression of obesity.\textsuperscript{149}

- **Chhanda Mallick et al., (2007)** evaluated the antihyperglycemic effects of separate and composite aqueous-methanolic (40:60) extract of root of *Musa paradisiaca* and leaf of *Coccinia indica* in streptozotocin-induced diabetic male albino rat and the comparative analysis of the results revealed that the extract of the studied plants when used in composite manner on streptozotocin-induced diabetic state has a more potent antidiabetogenic effect in comparison to the antidiabetogenic activities of the individual extract of the plants.\textsuperscript{150}

- **Farook Anwar et al., (2007)** reviewed the multiple medicinal uses of different parts of *Moringa oleifera*. The Moringa plant provides a rich and rare
combination of zeatin, quercetin, β - sitosterol, caffeoylquinic acid and kaempferol. In addition to its compelling water purifying powers and high nutritional value, *M. oleifera* is very important for its medicinal value. Various parts of this plant such as the leaves, roots, seed, bark, fruit, flowers and immature pods act as cardiac and circulatory stimulants, possess antitumor, antipyretic, antiepileptic, anti-inflammatory, antiulcer, antispasmodic, diuretic, antihypertensive, cholesterol lowering, antioxidant, antidiabetic, hepatoprotective, antibacterial and antifungal activities, and are being employed for the treatment of different ailments in the indigenous system of medicine, particularly in South Asia.\textsuperscript{119}

- J. H. Doughari \textit{et al.}, (2007) evaluated the Antibacterial effects of *Balanites aegyptiaca* L. Drel. and *Moringa oleifera* Lam. on *Salmonella typhi* and concluded that activities of these plant extracts were comparable to those of antibiotics, ciprofloxacin, cotrimoxazole and chloramphenicol, commonly used for treating typhoid fever.\textsuperscript{151}

- Martha Thomson \textit{et al.}, (2007) studied the hypoglycemic, hypocholesterolaemic and hypotriglyceridaemic effects of garlic (*Allium sativum* Linn.) in streptozotocin (STZ) - induced diabetic rats and founds that that raw garlic possesses a beneficial potential in reversing proteinuria in addition to reducing blood sugar, cholesterol and triglycerides in diabetic rats.\textsuperscript{105}

- Matthew Egbobor Eja \textit{et al.}, (2007) made a comparative assessment of the antimicrobial effects of garlic (*Allium sativum*) and antibiotics on diarrheagenic organisms and found prominent antimicrobial activity of garlic.\textsuperscript{152}

- M. Mostofa, \textit{et al.},(2007) evaluated antidiabetic effects of *Catharanthus roseus*, *Azadirachta indica*, *Allium sativum* and glimepride in experimentally diabetic induced rat and found significant antidiabetic activity of *Catharanthus roseus*, *Azadirachta indica* and *Allium sativum*.\textsuperscript{153}
• **M. S. Rahman et al., (2007)** investigated the antinociceptive, antioxidant and cytotoxic activities of ethanolic extract of *Leucas aspera* root. The extract produced significant writhing inhibition in acetic acid induced writhing in mice at the doses of 250 and 500 mg/kg. The extract showed a significant free radical scavenging activity with an IC$_{50}$ of 8 µg/ml. The extract showed significant lethality to brine shrimp with an LC$_{50}$ value.$^{154}$

• **Ping-Hsien Chuang et al., (2007)** evaluated the anti-fungal activity of crude extracts and essential oil of *Moringa oleifera* Lam and reported that ethanol extracts showed anti-fungal activities in vitro against dermatophytes such as *Trichophyton rubrum*, *Trichophyton mentagrophytes*, *Epidermophyton xoccosum*, and *Microsporum canis*.155

• **S. Manjula et al., (2007)** evaluated the hypoglycemic and hypolipidemic effect of aqueous leaf extract of *Coccinia indica* Wight & Arn in alloxan induced diabetic rats and The results of this study revealed that a continuous administration of *Coccinia indica* leaf extract for 21 days prevents the elevation of the level of serum lipids secondary to the diabetes state.156

• **Ahmad Najam et al., (2008)** reviewed the potential of *Boerhavia diffusa* and *Clerodendrum aculeatum* as anti-viral and anti-cancer agents. The roots of *B. diffusa* are rich source of a basic protein, which is used for inducing systemic resistance in many susceptible crops against commonly occurring viruses.157

• **A. K. Tuba et al., (2008)** evaluated the antioxidant and radical scavenging properties of curcumin. Curcumin (diferuoyl methane) is a phenolic compound and a major component of *Curcuma longa* L. The antioxidant activity of curcumin was measured by various in vitro antioxidant assays such as 1,1-diphenyl-2-picryl-hydrazyl free radical (DPPH•) scavenging, 2,2'-azino-bis(3-ethylbenzthiazoline-6-sulfonic acid) (ABTS) radical scavenging activity, N,N-dimethyl-p-phenylenediamine dihydrochloride (DMPD) radical scavenging activity, total antioxidant activity determination by ferric thiocyanate, total
reducing ability determination by the Fe$^{3+}$-Fe$^{2+}$ transformation method, superoxide anion radical scavenging by the riboflavin/methionine/illuminate system, hydrogen peroxide scavenging and ferrous ions (Fe$^{2+}$) chelating activities and reported that curcumin had an effective DPPH• scavenging, ABTS•+ scavenging, DMPD•+ scavenging, superoxide anion radical scavenging, hydrogen peroxide scavenging, ferric ions (Fe$^{3+}$) reducing power and ferrous ions (Fe$^{2+}$) chelating activities.\textsuperscript{158}

- **Bahman Nickavar et al., (2008)** evaluated the antioxidant and free radical scavenging properties of the ethanolic extract of five Mentha species [\textit{M. longifolia} (L.) Huds., \textit{M. piperita} L., \textit{M. pulegium} L., \textit{M. rotundifolia} (L.) Huds., and \textit{M. spicata} L.]. The antioxidant activities of the extracts were investigated with two different methods, 2,2’-diphenyl-1-picrylhydrazyl radical (DPPH•) and 2,2’-azinobis (3-ethylbenzothiazoline-6-sulfonic acid) radical (ABTS•+). \textit{M. piperita} exhibited the strongest activity as a DPPH• scavenger. On the other hand, all the extracts were active in the ABTS•+ assay and no significant difference was observed in this assay. The total phenolic content (TPC) of the extracts was determined by Folin-Ciocalteu method and \textit{M. piperita} showed the highest TPC. A high correlation was found between the DPPH• scavenging potency and the total phenolic content of the extracts.\textsuperscript{159}

- **B. Sharma et al., (2008)** investigated the antimicrobial activities of extracts of different parts of \textit{Tridax procumbens} L. (Asteraceae) and \textit{Capparis decidua} Forsk (Edgew) using disc diffusion assay, against two Gram negative bacteria (\textit{Escherichia coli} MTCC 46 and \textit{Proteus mirabilis} MTCC 425), one Gram positive bacteria (\textit{Staphylococcus aureus} MTCC 87), and a fungi (\textit{Candida albicans} MTCC 183) and the Results of the present study indicate that \textit{T. procumbens} and \textit{C. decidua} can be exploited for future antimicrobial drugs.\textsuperscript{160}

- **E. Ernst et al., (2008)** reviewed randomized clinical trials of \textit{Boswellia serrata} extract as a treatment for any human medical condition and states that \textit{Boswellia
serrata extracts were clinically effective for the trials related to asthma, rheumatoid arthritis, Crohn’s disease, osteoarthritis, and collagenous colitis.161

• **Nitin Verma et al., (2008)** evaluated the antioxidant activity of defatted ethanolic extract of fruits of *Ficus bengalensis* for its free radical scavenging property in different in vitro models as 1, 1-diphenyl-2-picryl hydrazyl (DPPH), nitric oxide, superoxide, hydroxyl radical and lipid peroxide radical model and reported that The extract showed significant dose-dependent free radical scavenging property in all the models except in hydroxyl radical inhibition assay.162

• **R. L. Gaur et al., (2008)** evaluated antifilarial activity of *Caesalpinia bonducella* against experimental filarial infections and concluded that *C. bonducella* seed kernel extract and fractions showed microfilaricidal, macrofilaricidal and female-sterilizing efficacy against *Litomosoides sigmodontis* and microfilaricidal and female-sterilizing efficacy against *Brugia malayi* in animal models, indicating the potential of this plant in providing a lead for new antifilarial drug development.108

• **R. Maheswaran et al., (2008)** evaluated larvicidal activity of Crude leaf extracts of *Leucas aspera* against *Culex quinquefasciatus* and *Aedes aegypti*. The hexane extract of *Leucas aspera* showed highest larvicidal activity against the two vector mosquitoes followed by chloroform and ethanol.163

• **You-Cheng Hseu et al., (2008)** investigated the antioxidant activity of aqueous extracts of *Toona sinensis* (TS; 0–100 µg/mL) and gallic acid (0–50 µg/mL), with the purified natural phenolic components evaluated using different antioxidant models. It was found that the TS extracts and gallic acid possess effective antioxidant activity against various oxidative systems in vitro, including the scavenging of free and superoxide anion radicals, reducing power, and metal chelation and suggested that *T. sinensis* may act as a chemopreventative agent, providing antioxidant properties and offering effective protection from atherogenesis.164
• Ali et al. (2009) evaluated the anticonvulsive effect of seed extract of *Caesalpinia bonducella* (Roxb.) in pentylentetrazole, maximal electro shock, strychnine- and picrotoxin-induced convulsions models and reported that petroleum ether extract of seed kernals of *C. bonducella* possessed anticonvulsant activity which may be contributed to the presence of phytoconstituents such as saponins, proteins, homoisoflavone (bonducillin), carbohydrates and sterols present in the drug, as these are already reported for their anxiolytic and anticonvulsant activities.  

• Bhavna Sharma et al. (2009) evaluated the anti-diabetic potential of alkaloid rich fraction of fruits of *Capparis decidua* on diabetic mice and stated that alkaloid rich fraction showed promising results in terms of anti-diabetic activities, therefore, establishing its candidacy for further purification and characterization of the individual alkaloids, in order to understand their mechanism of action.  

• Dolly Jaiswal et al. (2009) evaluated the aqueous extract of leaves of *Moringa oleifera* Lam. and reported that use of *M. oleifera* as an ethnomedicine to treat diabetes mellitus is scientifically justified.  

• D. H. Tambekar et al. (2009) evaluated the antibacterial potential of *Cyperus rotundus, Caesalpinia bonducella, Tinospora cordifolia, Gardenia gummiifera, Ailanthus excelsa, Acacia arabica, Embelia ribes and Ventilago maderspatana* from Melghat forest against *Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae, Proteus vulgaris, Salmonella typhi, Shigella flexneri, Salmonella paratyphi, Salmonella typhimurium, Pseudomonas aeruginosa, and Enterobacter aerogenes* by disc diffusion method. Out of these medicinal plants *Caesalpinia bonducella, Gardenia gummiifera* and *Acacia arabica* showed remarkable antibacterial potential.  

• F. Nikhat et al. (2009) evaluated the antioxidant activity of butanolic extract of the roots of *Syzygium cuminii* (L) skeel by two in vitro methods- reducing power
and DPPH and the results of the study showed significant antioxidant activity of butanolic extract of the roots of *S. cuminii*.168

- **G. L. Viswanatha et al., (2009)** evaluated the anxiolytic and anti-convulsant activity of the alcoholic extract of heart wood of *Cedrus deodara* at a dose of 50, 100 and 200 mg/kg in mice and reported that 100 and 200 mg/kg doses of extracts are having good anxiolytic and anticonvulsant activity.169

- **Junaid Niazi et al., (2009)** evaluated post- and pre-treatment anti-inflammatory activities of the aqueous extract of fresh leaves of *Coccinia indica* in rats using the carrageenan-induced paw oedema method at various dose levels. Analgesic and antipyretic properties were evaluated using tail flick model and yeast-induced hyperpyrexia, respectively and the results of the study has established the anti-inflammatory activity, analgesic and antipyretic activity of *C. indica* and, thus, justifies the ethnic uses of the plant.170

- **Mohammad Asif et al., (2009)** evaluated anti-inflammatory activity of 90% ethanolic extract of *Dalbergia sissoo* (Roxb.) bark using a right hind paw oedema method in wistar rats. The results of the study showed that the ethanolic extract of *D. sissoo* bark at 1000 mg/kg showed the most potent anti-inflammatory activity compared to the other groups (300 and 500 mg/kg) throughout the observation period.171

- **Ratnesh K Sharma et al., (2009)** evaluated antioxidant activity aqueous extracts of leaves of *Trichosenthes dioica*, fruits of *Moringa olifera* and *Ficus bengalensis* as well as seeds of *Emblica officinalis*. Total antioxidant activity of these extracts was monitored by Free Radical Absorbing Power (FRAP) assay. The extract from seeds of *E. officinalis* was found to contain highest antioxidant activity as compared to the preparations from other plants. The high antioxidant activity and flavonoids contents in *E. officinalis* seeds indicated that it could be exploited as an ingredient in developing a potential antioxidant supplement.172
• **Riadh Ksouri et al., (2009)** investigated the antioxidant and antimicrobial activities of leaf and flower extracts of *Tamarix gallica L.* and their phenolic composition. Results showed that flowers exhibit a higher antioxidant activity as compared to the leaves. Also, Tamarix extracts showed appreciable antibacterial properties against human pathogen strains.\(^{173}\)

• **R.P. Rachh et al., (2009)** evaluated antioxidant activity of extracts of *Boerhavia diffusa* dried root powder. In evaluation, ethanol and methanol extracts were prepared and screened for in-vitro antioxidant activities using Ferric reducing power and Hydrogen peroxide scavenging activity. The activity was compared to standard antioxidant like ascorbic acid. Both the extract showed strong antioxidant activity in both the methods. Between these two extracts, ethanolic extract has shown better antioxidant activity as compared to methanolic extract in both the activities.\(^{174}\)

• **Abdul Mannan et al., (2010)** evaluated antihyperglycemic activity of methanol extracts of Leaf and Stem of *Leucas Aspera* (Willd.) Link and *Lannea Coromandelica* (Houtt.) Merr. Bark Extract in Mice and concluded that the leaves and stems of *Leucas aspera* and the bark of *Lannea coromandelica* can form the subject of further scientific studies in the quest for better anti-diabetic drugs.\(^{175}\)

• **Arshad Hussain et al., (2010)** investigated the antibacterial activity of aqueous and organic solvent (Petroleum ether, chloroform and ethanol) extracts of *Coccinia indica* against *Enterobacter aerogenes, Pseudomonas aeruginosa, Staphylococcus epidermidis, Bacillus subtilis* and *Salmonella typhimurium* by agar well diffusion method and broth dilution method. Results showed promising antibacterial activity against the bacteria tested. Among these, ethanol and aqueous extracts were found to have a more potent inhibitory effect comparing with the other extracts.\(^{176}\)
• **B. M. Goyal et al., (2010)** reviewed the pharmacological potential of *Boerhavia diffusa* and reported evidence based information regarding the immunomodulatory activity, antibacterial activity, anti-inflammatory activity, anti-viral activity, antilymphoproliferative activity etc. of different part of *Boerhavia diffusa*.\(^{177}\)

• **D. Dhayabaran et al., (2010)** evaluated anxiolytic and anticonvulsant activity of alcoholic extract of heart wood of *Cedrus deodara* Roxb. in rodents and reported that 100 and 200 mg/kg doses of alcoholic extract of heart wood of *Cedrus deodara* exhibit anxiolytic and anticonvulsant activity.\(^ {178}\)

• **Ginter E. et al., (2010)** reviewed the role of garlic in cardiovascular diseases and reported that garlic as a dietary component appears to hold promise to reduce the risk of cardiovascular disease.\(^ {179}\)

• **Praveen Sharma et al., (2010)** examined 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 PGE2 induced diarrhoea. Loperamide (2 mg/kg) and atropine (0.1 mg/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 PGE2 to give anti-diarrhoeal effects. Result of charcoal meal test also suggests its anti-muscarinic activity.\(^ {180}\)

• **Rehana Parveen et al., (2010)** evaluated the antifungal activity of *Cedrus deodara* root oil and its compounds against *Candida albicans* and *Aspergillus fumigates* and found that *Cedrus deodara* oil at the concentration of 150 µg/disc showed zone of inhibition against *A. fumigatus* but at the same concentration did not show any antifungal activity against *C. albicans*.\(^ {112}\)
• **Rehana Parveen et al., (2010)** evaluated the effect of *Cedrus deodara* root oil on the histopathology of rat liver and kidney and reported that the root oil of *C. deodara*, at doses of 0.5 ml and 2.5 ml per rat orally administered, produced some adverse effects on the tissues tested but these effects were not lethal. Some toxic changes in the tissues of liver and kidney were also found.\(^\text{113}\)

• **Babita Agrawal et al., (2011)**, reviewed the phytochemical and pharmacological profile of *Boerhavia Diffusa* Linn. and reported that Boerhavia species are rich source of alkaloids, steroids and flavones. They also states the hepatoprotective, diuretic, anti-inflammatory, anti-stress and immunomodulation, antifertility, antimicrobial, antiviral and insecticidal activities of *Boerhavia Diffusa* Linn.\(^\text{181}\)

• **Lijun Sun et al., (2011)** evaluated the antioxidant activity of an extract of total flavonoids from persimmon leaves (*Diospyros kaki* L.). The effect of extract on total antioxidant activity, reducing power, 1,1-diphenyl-2-picrylhydrazyl (DPPH\(^\bullet\)) radical scavenging, superoxide anion radical scavenging, hydroxyl radical scavenging and metal chelating activities was examined and concluded that extract possess potent antioxidant and free radical scavenging activities. These antioxidant activities could contribute, at least in part, to the traditionally claimed therapeutic benefits of persimmon leaves.\(^\text{182}\)

• **Mandeep Kaur et al., (2011)** evaluated the anti-convulsant activity of *Boerhavia diffusa* and suggested that the methanolic extract of *B. diffusa* roots had anti-convulsant activity against PTZ-induced convulsions. As this activity retained only in liriodendrin-rich fraction, this confirms that the anti-convulsant activity of the crude methanolic extract is due to the presence of liriodendrin.\(^\text{183}\)

• **Mohammad Asif et al., (2011)** investigated the antinociceptive activity of ethanolic extract of the plant bark of *Dalbergia sissoo* (Roxb.) using tail flick method on wistar rats at dose levels (300, 500, and 1000 mg/kg) in 0.5% carboxyl methyl cellulose and reported that the extract exhibited significant and dose-dependent antinociceptive activity. Phytochemical investigation of the ethanolic
extract indicated the presence of carbohydrates, proteins, amino acids, phenolic compounds, and flavonoids. The antinociceptive activity of the bark extract of *D. sissoo* may be due to the presence of phytochemical constituents such as flavonoids. The acute toxicity study revealed that ethanolic extract was not toxic up to 3000 mg/kg body weight.\textsuperscript{184}

- **M. Z. Siddiqui (2011)** reviewed the anti-inflammatory property of oleo gum-resin of *Boswellia serrata*. The gum-resins of *Boswellia serrata* contain 30-60% resin, 5-10% essential oils, which are soluble in the organic solvents, and the rest is made up of polysaccharides. He also states that the resinous part of *Boswellia serrata* possesses monoterpenes, diterpenes, triterpenes, tetracyclic triterpenic acids and four major pentacyclic triterpenic acids i.e. β-boswellic acid, acetyl-β-boswellic acid, 11-keto-β-boswellic acid and acetyl-11-keto-β-boswellic acid, responsible for inhibition of pro-inflammatory enzymes. Out of these four boswellic acids, acetyl-11-keto-β-boswellic acid is the most potent inhibitor of 5-lipoxygenase, an enzyme responsible for inflammation.\textsuperscript{107}

- **Raja et al. (2011)** evaluated the antimicrobial activity of boswellic acid molecules of *Boswellia serrata* against 112 pathogenic bacterial isolates including ATCC strains. AKBA (Acetyl-11-keto-β-boswellic acid) was found to be the most active compound showing an MIC range of 2-8 µg/ml against the entire gram positive bacterial pathogens tested.\textsuperscript{185}

- **Surendra K. Pareta et al., (2011)** evaluated the Protective Effects of *Boerhavia Diffusa* Against Acetaminophen-Induced nephrotoxicity in Rats and suggested that *B. diffusa* has the potential in preventing the acetaminophen-induced nephrotoxicity.\textsuperscript{106}

- **Tsubura A, et al., (2011)** reviewed the anticancer effects of garlic and garlic-derived compounds for breast cancer control and states that Garlic and garlic-derived compounds reduce the development of mammary cancer in animals and suppress the growth of human breast cancer cells in culture. Oil-soluble
compounds derived from garlic, such as diallyl disulfide (DADS), are more effective than water-soluble compounds in suppressing breast cancer. Mechanisms of action include the activation of metabolizing enzymes that detoxify carcinogens, the suppression of DNA adduct formation, the inhibition of the production of reactive oxygen species, the regulation of cell-cycle arrest and the induction of apoptosis.\textsuperscript{186}

- \textbf{Fei Ke et al., (2012)} reviewed the ability to treat acute and chronic GI disorders, including ulcerative colitis of \textit{Aloe vera} gel, \textit{Wheat grass} juice, \textit{Boswellia serrata}, and bovine colostrum enemas and states that the use of \textit{Boswellia serrata} for the treatment of ulcerative colitis is justified and boswellic acid, the major constituent of \textit{Boswellia serrata}, is responsible for activity due to its direct inhibitory effect on 5-lipoxygenase.\textsuperscript{187}