CHAPTER-2

Literature review

Obesity is one of the leading causes of many diseases related to death worldwide (Barnees et al., 2007). There has been a large shift towards less physically demanding work and lack of exercise (Ness-Abramof and Apovian, 2006). In children, there appear to be decline in levels of physical activity due to loss of physical education (Salmon and Timperio, 2007). In both children and adults, there is an association between television viewing time and the risk of obesity (Vioque et al., 2000). A 2008 meta-analysis found 63 of 73 studies (86%) showed an increased rate of childhood obesity with increased media exposure, with rates increasing proportionally to time spent watching television (Kumari, 2011). The WHO further projects that by 2015, approximately 2-3 billion adults will be overweight and more than 700 million will be obese (WHO, 2006).

2.1 Lifestyle approaches

2.1.1 Diet

For weight loss to occur, energy intake must be less than energy spent. Reduced calories diets include those specifying caloric intakes that are very low (less than 500 Kcal), low (800-Kcal) and moderate (less than 1500 Kcal) daily intake. In the absence of changes in physical activity consumption of about 500 less Kcal per day predicts a weight loss of about 0.45kg per week. Very low calorie diets should be used only when rapid weight loses is needed. Medical monitoring is necessary with such diets. Adding dietary fibres (Howarth et al., 2001) and using meal replacements (Heymsfield et al., 2003). The involvement of the dieticians has been shown to improve weight reduction in primary care sittings (Ashley et al., 2001).

2.1.2 Low fat diets

Although substantial epidemiologic and ecologic data have indicated an association between lower fat intake and lower body weight (Bray and Popkin,
1998), low fat diets remain controversial (Willett, 2002). The traditional approach to weight reduction has been to restrict dietary fats to less than 30% of total calories. A very low fat diet typically derives no more than 15% of total calories from fat, with about 15% of calories from protein and about 70% from carbohydrates. The lifestyle heart trial, an intensive programme of dietary counselling, stress management and moderate exercise in patient with coronary heart disease which reduce subjects food intake to 7% of calories, resulted in a weight loss of about 11 kg after one year, with a lower rate of progression of coronary heart disease at 5 years (Ornish et al., 1990).

### 2.1.3 Low Carbohydrate Diets

In recent year, low-carbohydrate diets (less than 60 g of carbohydrate daily) have received increased attention. Many of them (e.g. The Atkins and South Beach diets) start with less than 20 g of carbohydrates daily and gradually increase its quantity. Randomized trail have shown that in the first 6 months, low-carbohydrate diet result in significantly more weight loss than low fat diets (Stern et al., 2004), with the exception of one study (Gardner et al., 2007). However this difference was no longer significance at 12 months. Diets low in carbohydrates (as compared to those low in fat) results in low glucose levels in patient with hyperglycaemia, lower fasting levels of plasma triglycerides and higher high density lipoprotein cholesterol, however they also decrease low density lipoprotein cholesterol levels.

### 2.1.4 Low Glycemic Index Diets

The glycemic index is a rating system for food based on the extent to which they raise blood glucose levels two hours after their consumption. In randomized trials reduced glycemic index diets have not resulted in increased weight loss beyond that explained by caloric restriction (Raatz et al., 2005, Ebbeling et al., 2007). Plasma insulin levels are reduced with such diets, but whether this reduction translates into improved outcomes is not known.
2.1.5 High Protein diets

Diets high in protein are usually high in fat. Because protein may enhance satiety, increase meal induced thermogenesis, protect lean body mass and decrease energy efficiency (Westerterp and Lejeune, 2005), the substitution of protein for carbohydrates during weight loss has been increasingly emphasized. In randomized trials, substitution of protein for carbohydrates in caloric restriction diets resulted in more weight loss (Noakes et al., 2005)

2.1.6 Specific commercial diets

In two U.S. trails a total of 471 subjects were randomly assigned to one of four dietary plan. Atkins (Carbohydrate restriction) Zone (40% carbohydrates, 30% fat and protein) weight watchers or another, similar program calorie restriction (Gardner et al., 2007). In the first trial involving men and women 22 to 72 years old with known hypertension, dyslipidemia or fasting hyperglycaemia (Dansinger et al, 2005) the mean weight loss at 1 year was similar for all four diets. In the second study (involving healthy women 20 to 50 years old), the Atkins diet resulted in more weight loss than the zone diet, with no other significant differences in weight loss observed among the diets (Gardner et al., 2007). In a study, the United Kingdom healthy overweight or obese adults were randomly assigned to one of four diet plans-Atkins, Slim-fast Weight Watchers, or Rosemary Conley or to control group. A 6 months, all diets had led to significant similar losses of body fat and to reductions in blood pressure the diets showed only modest differences in their effects on total cholesterol and fasting glucose levels (Truby et al., 2006).

2.2 Physical Activity

Increased physical activity alone, without decreased caloric intake is associated with only modest weight reduction (Miller et. al. 1997). For example in one trial, participants who were instructed to jog the equivalent of 20 miles (32.2 km) as week but not to restrict their caloric intake lost only 2.9 kg in 8
months (Silent et al., 2004). However, increased physical activity without caloric restriction can reduce abdominal (visceral) adipose tissue and improve insulin resistance (Wilmore et al, 1999). Increased physical activity combined with caloric restriction result in more weight reduction and more favourable changes in body composition (fat mass v/s lean mass) than diet or physical activity alone (Miller et al., 1997), similarly increases in plasma HDL cholesterol levels and reductions in triglyceride levels and blood pressure are greater with a combination of dietary restriction and aerobic exercise than with diet alone (Wood, 1994).

2.3 Behavioural Modification

The key features of the standard behavioural-modification program include goal setting self-monitoring stimulus control (modification of one’s environment to enhance behaviours that will support weight management), cognitive restructuring (increased awareness of perceptions of oneself and one’s weight) and prevention of relapse (weight regain) (Poston and Forety, 2000). Wadden (2000) has been reported that the diet, exercise, diet and exercise or diets with appetite-suppressants usually result in minimal weight loss with rapid weight regain. When a behaviour modification component is combined with any of these weight loss strategies, the results are far better.

2.4 Pharmacological Therapy

Pharmacological therapy is appropriate for some patients as an adjunct to lifestyle of facilitate weight loss and prevent weight regain. Current criteria for the use of pharmacological therapy for obesity are a BMI above 27-30 in the presence of coexisting condition (Bray, 1998). Only four drugs have been approved by the Food and Drug Administration (FDA) for weight reduction (Table 2.1). In randomized trials of FDA-approved medications combined with changes in lifestyle, as compared with placebo and changes in lifestyle, the reduction in initial weight was 3 to 5% greater with the medications, reduction in
risk factors for cardiovascular disease are generally related to the amount of weight reduction. Phentermine and diethpropion are adrenergic stimulants that enhance the release of norepinephrine in certain brain regions and reduce food intake. Efficacy and safety data for these drugs are limited. In the randomized trails of phentermine and diethylpropion Li et al., 2005 weight reduction has been reported 3% to 4% greater in the medication group than in the placebo groups. Blood pressure must be closely monitored in patients who have prehypertension or are being treated for hypertension. Dependency is an addition concern; these drugs have been classified by the Drug Enforcement Agency as Schedule IV controlled substance, indicating that there is potential for abuse but that it is considered to be low. Limited data suggest these stimulants may be effective for more than 10 years (Frank, 2004), but they have been approved for short-term use. Sibutramine is a serotonin-norepinephrine reuptake inhibitor that reduces appetite. In several randomized trails, weight loss was about 5% greater for subjects taking sibutramine than for those taking placebo (Li et al, 2005). The combination of sibutramine and group program of lifestyle modification resulted in more weight loss at 12 months (12.1 Kg) than did use of sibutramine (5.0 kg) or the lifestyle intervention alone (6.7 kg) (Wadden et al., 2005). Successful weight maintenance after reduction was reported to be most likely in subject who continued to take sibutramine and in those who had the greatest weight loss and were most physically active (Van-Baak et al., 2003).

Orlistat is a triacylglycerol lipase inhibitor that works in the intestinal lumen to reduce dietary fat absorption by about 30% (Hvizdos & Markham, 1999). Although a low fat diet is recommended for patients taking orlistat, its pharmacologic effect is dependent on the presence of dietary fat. The major side effects- oily spotting, flatus with discharge and faecal urgency are typically short-lived. One study showed that orlistat combined with lifestyle changes reduced body weight by about 3% more than lifestyle intervention alone (Kaplan, 2005).
In one trial, the use of Orlistat for 4 years reduced the incidence of diabetes beyond that achieved with lifestyle changes (Torgerson et al. 2004). In another trial, the combination of Orlistat and sibutramine therapy was not superior to either drug alone (Wadden et al., 2000).

The cannabinoid system contributes to the regulation of food intake; energy balance and body weight (Pagotto et al., 2006). In randomized trials, subjects taking rimonabant (a selective blocker of the cannabinoid receptor CBI) lost about 5% more weight than those taking placebo (Christensen et al, 2007). The possibility was raised that the drug might have beneficial effects on HDL cholesterol and triglyceride levels that are independent of weight loss. Rimonabant (cannabinoid receptor antagonist that act on brain and decrease the appetite) is approved for the treatment of obesity in most of Europe and in Mexico and Argentina. It has not been approved for this use by the FDA because of concerns about adverse effects, including depression and anxiety as well as nausea and diarrhoea. In randomized trials, weight loss was about 5% greater for subject taking sibutramine than for those taking placebo (Li et al, 2005).
Table 2.1 Drugs used for Weight Loss

<table>
<thead>
<tr>
<th>Drug</th>
<th>Mechanism</th>
<th>Dose</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diethylpropion</td>
<td>Sympathomimetic mechanism</td>
<td>25 mg 3 times a day or 75 mg controlled</td>
<td>Dry mouth, insomnia, dizziness, mild increase in blood pressure and heart rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>release daily</td>
<td></td>
</tr>
<tr>
<td>Orlistat</td>
<td>Lipase inhibition in gastrointestinal treat</td>
<td>120 mg 3 times a day or 60 mg 3 times in day</td>
<td>Oily spotting flatus with discharge, faecal urgency</td>
</tr>
<tr>
<td>Phentermine</td>
<td>Sympathomimetic mechanism</td>
<td>15, 30 or 37.5 mg daily</td>
<td>Dry mouth insomnia dizziness mild increase in blood pressure (rarely more severe) and heart rate.</td>
</tr>
<tr>
<td>Sibutramine</td>
<td>inhibition of norepinephrine and serotonin reuptake</td>
<td>5,10 or15 mg daily</td>
<td>Mild increase in blood pressure and heart rate (Rarely more severe), palpitations</td>
</tr>
</tbody>
</table>

2.5 *Mechanisms of obesity*

An imbalance between energy intake and expenditure results in storage of energy as body fat. Intake of energy in the form of food and nutrients and its subsequent utilization or storage is regulated by a feedback control system that consists of hormones, neurotransmitters, and the central nervous system (Rosenbaum *et al.*, 1998). Ghrelin, growth hormone–releasing hormone, neuropeptide Y, melanocyte-concentrating hormone, peptide YY and insulin increase appetite and decrease energy expenditure, while cholecystokinin, enterostatin, glucagon, leptin and brain-derived neurotrophic factor suppress food
intake and increase energy expenditure. Leptin uptake into the brain is facilitated by leptin receptors expressed by endothelial cells in the blood brain barrier that function as leptin transporters (Guzik et al., 2003). Leptin is the chief regulator of the “brain gut axis”, which provides a satiety signal through its action on the CNS receptors within the hypothalamus (Konturek et al., 2004), a site of high leptin receptor bind (LRb) mRNA expression (Schwartz et al., 2000). In the hypothalamus, leptin acts on neurons (figure 2.1) that directly or indirectly regulate levels of circulating hormones (e.g., thyroid hormone, sex steroids, and growth hormone) (Huo et al., 2004). Activation of hypothalamic leptin receptors suppresses food intake and promotes energy expenditure pathways (Tilg et al., 2006).

Figure 2.1 Model of central nervous system control of energy homeostasis (Schwartz et al., 2000).
Leptin levels decrease with weight reduction. Conversely, lack of leptin signaling due to mutation of leptin or the leptin receptor (LR) results in increased food intake in combination with reduced energy expenditure and a phenotype reminiscent of the neuroendocrine starvation response (including hypothyroidism, decreased growth, infertility, and decreased immune function) in spite of obesity (Elmquist et al., 1999).

2.6 Some antiobesity effects of medicinal plants and their phytoconstituents

Chaudhari et al. (2011) have reported the preventive effect of embelin from *Embelia ribes* on lipid metabolism and oxidative stress in high fat diet induced obesity in rats.

*Panax japonicus* contains Chikusetsusaponins which prevent high fat diet induced increased body weight and fat storage in adipose tissue of Sprague-Dawley rats (Inoue et al., 1999).

The *Lagerstroemia speciosa* extract shows a significantly reduced body weight (~10%) in obese mice compared with control mice fed with a regular diet (Suzuki et al., 1999).

Aqueous extract of *Zingiber officinale* at 0.4 ml/kg, *Hibiscus sabdariffa* and *Zingiber officinale* at 1ml/Kg body weight showed significant decrease in plasma glucose and cholesterol in rats fed with 99% growers mash and 1% cholesterol (Agoreyo et al., 2008).

Oben et al., (2006) have been reported that the extract of *Cissus quadrangularis* at a dose of 300 mg daily showed reductions in weight, body fat, total cholesterol, LDL-cholesterol, triglycerides and fasting blood glucose levels.

Dev (1997) and Nityanand et al., (2003) have reported that *Commiphora mukul* contains stereoisomers E and Z-guggulsterone.
Parijat et al., (2007) have reported that gymnemic acids is active compound that there could be a possible link between obesity, Gymnemic acids and diabetes.

Hong et al., (2006) developed a genetic multifactor syndrome model which exhibits progressive overweight, hyperlipidemia and hyperglycemia.

Saravanan and Nalini (2007) studied the Hemidesmus indicus reduced the level of elevated plasma and hepatic levels of total cholesterol, triglycerides, lipoproteins, phospholipids and free fatty acids in rats.

The α and β penta-O-galloyl-D-glucopyranose (PGG), components of tannic acid from Lagerstroemia speciosa are responsible for the adipogenesis inhibitory activity (Liu et al., 2001).

Ram et al., (1996) showed hyperlipidaemic effects of ethanolic extract of Myristica fragrans in rabbits.

Kim et al., (2005) have reported that the protopanaxadiol and protopanaxatriol of saponin fraction form Panax ginseng reduced the body weight, adipose tissues, level of serum Lipid and leptin in the high fat diet fed rats.

Ji et al., (2008) investigated saponin fraction of Panax ginseng which contains protopanaxadiol and protopanaxatriol reduced the body weight, total food intake, fat contents and total cholesterol and leptin levels in high fat diet induced rats.

Vijayakunar and Nalini (2005) have reported that the piperine from Piper longum supplementation in high fat diet fed male Wistar rats reduced the levels of plasma total cholesterol, low density lipoprotein (LDL) and very low-density lipoprotein (VLDL).

The ethanolic extract of roots of Plumbago zeylanica, alone and in combination with vitamin E, significantly reduced serum total cholesterol, LDL
cholesterol and triglyceride levels in experimentally induced hyperlipidaemic rabbits (Dwivedi, 1997).

Madhava et al., (2006) have reported that the plant powder root taken orally in dosage of 2-3 pills twice a day for about 3 months with lukewarm water or butter milk, results in reducing excessive lipid levels in blood i.e. reduces obesity.

Ukwuani et al., (2008) studied the aqueous pulp extract of Tamarindus indica and reported a decrease the body weight of rats. Though the rats were fed diet with adequate protein, the plant extract might not have allowed proper absorption of protein which could account for the decreased body weight.

Garcinia cambogia is suggested for the presence of hydroxyl citric acid which seems to inhibit citrocoliasis and enzyme involved in the transformation of glucides into fatty deposits. (Heymsfield et al., 1998).

Ephedrine is a constituent of Ephedra spp., and is often used in products for the management of obesity. Structurally it is related to phenylpropanolamine, and appears to act by causing the release of presynaptic norepinephrine and the stimulatory effect of the thermogenic β-adrenergic receptors (Joseph et al., 1996).
Medicinal plants under present investigation

Basis for selection of plant

i. *Boerhavia diffusa*: Flavonoid

ii. *Saccharum spontaneum*: polyphenolic compound

iii. *Dalbergia latifolia*: Flavonoid

2.7 *Boerhavia diffusa* (Punarnava)

2.7.1 Introduction

The plant was named in honor of Hermann Boerhaave, a famous Dutch physician of the 18th century (Chopra, 1969).

*Boerhavia diffusa* (Spreading Hogweed), belonging to the family of the Nyctaginaceae, is mainly a diffused perennial herbaceous creeping weed in India known under its traditional name as Punarnava.

![Boerhavia diffusa plant](image)

**Figure 2.2**: *Boerhavia diffusa* plant

![Roots of Boerhavia diffusa](image)

**Figure 2.3**: Roots of *Boerhavia diffusa*
2.7.2 Chemical constituents

The active constituents of Punarnava root is a mixture of punarnavine, xanthine derivatives, ursolic acid, β-sitosterol and fatty acids. It also contains inorganic salts such as potassium nitrate, potassium sulphate and chloride (Jalard and Jalard, 2007).

Punarnava roots contain triacontanol, hentriacontane, 5,7-dihydroxy-3,4-dimethoxy-6,8-dimethyl flavone glucose and hypoxanthin-9-arabinoside. Besides these phytoconstituents it also contain purine nucleoside hypoxanthine-9-arabinofuranoside and rotenoid analogues like boeravinones A, B, C, D, E and F (Ali, 1998).

2.8.3 Traditional uses

In Punjab region, the drug is useful for the eye disease and in Bombay used for dropsical swellings. The leaves juice is used in jaundice and the root is generally used in internal inflammation, laxative and also in urinary disease (Kirtikar and Basu, 2005).

Leyon et al. (2005) reported that the methanolic extracts of the plant was effective in reducing metastases formation in some melanoma cells.

It is also used in the treatment of stomach ache, anaemia, cough and cold, laxative and expectorant, also says a potent antidote for snake and rat bites (Chopra et al., 1956).

Punarnava is useful in the treatment of nephritic syndrome (Singh and Udupa, 1972).

Mudgal (1975) reported that punarnava root is useful in hepatitis, gall bladder abnormalities and urinary disorders. The flowers and seeds are used as a contraceptive (Chopra et al., 1956).

2.8.4 Chemical review

Cho et al. (2004) and Ujowundu et al. (2008) reported that plant is a rich source of vitamins, minerals, protein and carbohydrate and contain a number of
constituents mainly as alkaloids, flavonoids, saponins and steroids. Most investigations on the plant have centred on the root, whereas significant differences in the chemical composition of the root and leaves have been reported (Pereira et al., 2009).

Diestra et al., (2002), Satheesh and Pari, (2004) have reported that punarnava contains quinolizidine alkaloids, potassium salts, Boeravinones G and H alkaloids.

The purified glycoprotein from B. diffusa exhibits strong antimicrobial activity against RNA bacteriophages (Awasthi and Menzel, 1986).

2.7.5 Pharmacological review

The whole plant extract is hepatoprotective (Evans, 2002). It is also used in treatment of diabetes (Pari and Amarnath, 2004).

The depletion of the germinal epithelial lining of the seminiferous tubules with enhanced number of germinal cell, decreased sperm counts with increased percentage of tail and head abnormalities and increases in both pre and post-implantation tissue has been reported (Farida et al., 2007).

It has anti-proliferative activity against a variety of tumour cell lines (Mehrotra et al., 2002), and antioxidant activity of leaf extract of B. diffusa in tissues of alloxan induced diabetic in rats (Kumaran and Karunakaran, 2007).

Punarnava is also reported to have adaptogenic and antistress activity (Desat et al, 2009) and roots have anti-inflammatory, fibrinolytic and anticonvulsant activities (Bharali et al, 2003).

Sharma et al., (2008) have been reported that the ethanol extract showed potent inhibitory effect on gram positive bacteria except Micrococcus luteus and gram-negative bacteria.

An aqueous extract of thinner roots of B. diffusa at a dose of 2 mg/kg exhibited in remarkable protection of various enzymes such as serum glutanic-
oxaloacetic transaminase, serum glutamicpyruvic transaminase and bilirubin in serum against hepatic injury in rats (Rawat et al., 1997).

Maximum diuretic and anti-inflammatory activities of Punarnava have been observed in samples collected during the rainy season. Due to the combination of these two activities, Punarnava is regarded therapeutically highly efficacious for the treatment of renal inflammatory diseases and common clinical problems such as nephritic syndrome, edema and ascites developing at the early onset of the liver cirrhosis and chronic peritonitis. The root is used to treat other renal ailments, seminal weakness and blood pressure (Anand, 1995).

*B. diffusa* has been reported to be beneficial in the treatment of nephrotic syndrome and compared well with corticosteroids. It is also demonstrated that the drug decreases the albuminurea, increases the serum protein and lowered serum cholesterol level (Ramabhimaiah et al., 1984).

Singh and Udupa (1972) reported that the dried root powder showed curative efficiency when administered orally for one month to the children or adults suffering from the helminth infection. The patients became worm-free within five days of the treatment. The drug, singly or in combination with other drugs, found to be efficient in liver disorders, gastrointestinal disorders, heart diseases (hypertension, angina, cardiac failure), respiratory tract infections, leucorrhea and spermatorrhea.

Chakraborti and Handa (1989) also reported a hepatoprotective activity of the aerial parts of *B. diffusa*. The hepatoprotective activity of the *B. diffusa* root was also demonstrated by and Chandan (1991).

These investigators found that the water extract from the root of *B. diffusa* minimised the toxic effects generated by the CCl4 and the thioacetamide in the liver. Further experimental studies have shown beneficial activity of the *Punarnava* root for the treatment of the jaundice (Gopal and Shah, 1985).
The treatment with the water extract from the root of *B. diffusa* induced leucocytosis with predominant neutrophils, associated to the phagocytosis ability and it bactericidal to the neutrophils and the macrophages (Mungantiwar *et al.*, 1997).

The recent study carried out by Pari and Amernath (2004) demonstrated that the leaves of *B. diffusa* reduced the levels of glucose in the blood by stimulating insulin release from the β cells of pancreas.

The water extract of *B. diffusa* possess protective abilities to the rodents suffering from the peritonitis induced by *Escherichia coli* (Hiruma-Lima *et al.*, 2000).

Mehrotra *et al.* (2002) reported that the extract of *B. diffusa* showed a significant immunosuppressive activity on human cells and on murine cells as well.

Toxicological studies conducted on *B. diffusa* demonstrated the absence of teratogenic and mutagenic effects (Singh *et al.*, 1991).

### 2.8 *Saccharum spontaneum*

#### 2.8.1 Introduction

*Saccharum spontaneum* Linn. known as Kasa, wild cane, wild sugar cane, Family: Poaceae, tall erect reed-like perennial grass and tropical Asia. This occurs throughout India along the sides of the river and tropics of old world, it is widely distributed in Andhra Pradesh, Vellore district in Tamilnadu.

![Figure 2.5: Saccharum spontaneum plant](image-url)
It is considered as valuable medicinal herb in traditional systems of medicine in India (Kirtikar and Basu, 2005; Parrotta, 2001).

2.8.2 Chemical constituents

Leaves and stalks contain carbohydrates, proteins and lignin (Ghani, 2003). Roots and root-stalks contain starch and polyphenolic compounds (Chopra et al., 1956).

2.8.3 Traditionally Uses

According to Siddha system of medicine, the whole plant used in various diseases of vaatam, pittam, vomiting, mental diseases, abdominal disorders, dyspnoea, anaemia and obesity. In Ayurveda, roots are used as astringent, emollient, refrigerant, diuretic, lithotriptic, purgative, tonic and aphrodisiac, and also useful in treatment of dyspepsia, burning sensation, piles, sexual weakness, gynecological troubles and respiratory troubles (kumar et al., 2010).

Aerial parts possess laxative and aphrodisiac properties, and also useful in burning sensations, strangury, phthisis, vesical calculi, blood diseases, biliousness and haemorrhagic diathesis (Chopra et al., 1956).

The stems are useful in injury conditions of pitta and vata, dyspepsia, renal and vesical calculi, haemorrhoids, menorrhagia dysentery, agalactia phthisis and general debility (Yoganarashimhan, 2002).

2.8.4 Pharmacological review

Alcoholic extract of rhizome and roots shows significant diuretic activity at a dose of 500 mg/kg (Mehrotra & Rastogi, 1993).

Kumar et al., (2010) studied the ethanolic extract of Saccharum spontaneum and has reported significant CNS depressant activity and aqueous extract has mild antipsychotic activity in Wistar rats.

Sathya and Kokilavani (2012) have reported that the ethanolic root extract of Saccharum spontaneum shows antiurolithiatic activity against calculi producing diet induced urolithiasis in rats.
2.9. *Dalbergia latifolia*

2.9.1 Introduction

*Dalbergia latifolia* (Roxb) Family- Fabaceae (Parrotta, 2001) a glabrous tree a single stem with characteristic smell (Prasad, 1993).

The bark is grey, thin with irregular short cracks, exfoliating in fibrous longitudinal flakes (Troup, 1921).

It is distributed in Bihar, Bundelkhand and Central India (Kirtikar and Basu, 2005). In Hindi, it is known as shisham.

![Figure 2.4: Dalbergia latifolia plant](image)

2.9.2 Chemical constituents

It contains dalbinol a new 12a-hydroxyrotenoid (Shyam and Chibber, 1978), Rastogi and Mehrotra (1993) reported that the *Dalbergia latifolia* bark contains sisafolin, coumarin, β- sitosterol, also contain dalbergichromene, lupeol, latifolin, and dalbergin from bark of the tree, heartwood contains latinone, neoflavonoid dalcridodon.

2.9.3 Traditionally uses

The stem barks contain tannin is used for treatment of leprosy, obesity and worm (Kirtikar and Basu, 2005).

The genus consists of 300 species and about 25 species occur in India. Many species of *Dalbergia* are important timber trees, valued for their decorative and often fragrant wood, rich in aromatic oils (Wealth of Indian Raw Materials. 1972, Chopra et al., 1980).
Dalbergia latifolia is reported to be used as aphrodisiac, abortifacient, expectorant, anthelmentic, antipyretic, appetizer, allays thirst, vomiting, burning sensation, cures skin diseases, ulcers, diseases of the blood, reduces obesity, used in leucoderma, dyspepsia, dysentery, for diseases of the eye and nose, syphilis, stomach troubles, leprosy, leucoderma, scabies and ringworm (Kirtikar and Basu, 2005; Nadkarni, 1954).

2.9.4 Chemical review

Latinone isolated and characterized, first binary neoflavanoid dalcriodain along with 2,7-dihydroxy-3-methoxyxanthone and 4’ 7’-dihydroxyflavan from heartwood (Rastogi and Mehrotra, 1993).

Thurlough et al., (1981) have been reported bark of the plant contain a substituted phenanthrene-1, 4-quinone.