Academic Journal of Plant Sciences 3 (3): 104-107, 2010
ISSN 1995-8986

Evaluation of Antilipidemic and Anti Obesity Efficacy of *Bauhinia purpurea* Bark Extract on Rats Fed with High Fat Diet

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Abstract: Methanolic extracts of *Bauhinia purpurea* (MEBP) were evaluated for their antilipidemic and antiobesity efficacy in high fat diet (HFD) induced male wistar albino obese rats. The body weight of HFD induced obese rats was reduced by 30 % when administered with sibutramine (standard antiobesity drug), while it was reduced by 24 % and 28 % respectively by 200 mg and 400 mg of MEBP/kg body weight. When HFD induced obese rats were administered with 200 mg/kg.b.w of MEBP, total cholesterol (TC), triglycerides (TG) and low density lipoproteins (LDL) decreased considerably while the high density lipoproteins (HDL) increased. The alterations in these lipid profiles were more pronounced with 400 mg/kg.b.w of MEBP. The antilipidemic effect of MEBP was found to be more effective than Sibutramine.

Key words: *Bauhinia purpurea* · Sibutramine · High fat diet · Body weight · Lipid profiles

INTRODUCTION

Obesity is a global health problem, resulting from an energy imbalance caused by an increased ratio of caloric intake to energy expenditure. Obesity is also known to be risk factor for the development of metabolic disorders, dyslipidemia, atherosclerosis and type 2 diabetes [1, 2] since many factors influence energy balance and they interact at many levels, determining the pathophysiology of obesity is difficult. The main determinant is a disturbance of the homeostatic mechanisms that control energy balance. Other factors such as food intake and lack of physical activity also contribute. In recent years, there has been a great increase in the use of herbal medicines for the treatment of obesity [3].

Bauhinia purpurea is a shrub or small tree of Fabaceae family. It is found in most types of vegetation ranging from evergreen lowlands, rain forests to mountain forests, up to 2000-3000 m altitude and also in savanna, scrub and dry deciduous forests to swamp forests on various soils. *Bauhinia purpurea* plant has been extensively used as Indian traditional and folklore medicine to cure various human ailments such as dropsy, pain, rheumatism, convulsions, wound healing, delirium and septicemia [4, 5], analgesic and anti inflammatory, nephroprotective activity [6, 7] and antidiabetic activity [8], *Bauhinia forficata* antidiabetic activity [9]. The bark of the plant is used as an astringent and its decoctions are recommended for ulcers as a useful wash solution [10]. The leaves and roots are used for the treatment of catarrh, infection of children, boil, glandular and swelling [11]. The aerial parts of the plant are reported to contain flavone glycosides, foliar flavonoids, 6-butyl-3-hydroxy flavanone, amino acids, phenyl fatty ester, lutine and β-sitosterl [12]. These active constituents have been attributed in the therapeutic activity of the plant [13]. Therefore, the present study was undertaken to evaluate the antihyperlipidemic and antiobesity activity of bark extracts of *Bauhinia purpurea*.

MATERIALS AND METHODS

Preparation of Plant Extract: The bark of *Bauhinia purpurea* was collected from'Seshachalam forest's of Andhra Pradesh, India. Freshly collected stem barks of *Bauhinia purpurea* were dried in shade and pulverized to a coarse powder and extracted with methanol using the soxhlet apparatus. The filtrate obtained was evaporated to dryness at 50-65°C in a rotary vacuum evaporator to obtain a dark colored molten mass.

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Experimental Animals: The male healthy wistar albino rats weighing 150-160 g obtained from the animal house of Sri Venkateswara agenesis, Bangalore were used in this study. The animals were maintained in well ventilated rooms with 12 h light and dark cycle in polypropylene cages. All animals were acclimatized to the laboratory conditions one week prior to the initiation of the study.

Composition of Normal and High Fat Diet: Composition of normal feed is 27% whole wheat, 25% yellow corn, 15% barley, 15% milk powder, 1% bone meal, 1% calcium chloride, 1% sodium chloride, 15% coconut oil and one multivitamin capsule. The high fat diet contains 23% whole wheat, 23% yellow corn, 11% barley, 17% milk powder, 1% bone meal, 1 % calcium chloride, 1% sodium chloride, 11% coconut oil, 11% butter and one multivitamin capsule.

Experimental Design: The obtained male healthy wistar albino rats were divided in to five groups, each group containing six animals. Group 1 was fed with normal diet (ND) and remaining groups fed with high fat diet (HFD) for 6 weaks.the experimental design was as follows.

Group 1: (normal diet)

Group 2: (HF diet control)

Group 3: HF diet + Standard drug

Group 4: HF diet +200mg MEBP/kg body weight

Group 5: HF diet +400mg MEBP/kg body weight

Estimation of Lipid Profiles: Blood samples were collected by carotid bleeding separately into sterilized dry centrifuge tubes from all groups of rats and allowed to stand for 30 min at 37°C. The clear serum was separated at 2500 rpm for 10 min and is used for the estimation of total cholesterol by CHOD-PAP method [14], high density lipoprotein (HDL) cholesterol by PEGCHOD- PAP method [15] and triglycerides by GPO-PAP method [16], using standard kits. LDL-cholesterol was calculated with reasonable accuracy by the Friedewald formula.

$$LDL = \frac{\text{Total cholesterol- HDL-Triglyceride}}{5}$$

RESULTS AND DISCUSSION

Body weight increased significantly in rats fed on HFD compared with controls (fed on normal diet) (Table 1). Treatment with Sibutramine reduced body weight of HFD fed obese rats by 30 % while 200 mg and 400 mg/kg body weight of methanol extract of *Bauhinia purpurea* (MEBP) caused a reduction of 24 % 28 % respectively in body weight during the treatment period (Table 1). Similar reports of reduction in body weights was earlier observed in humans/rats with *Chamaerops Humilis* leaves [17].

In the present study, a high fat diet resulted in dyslipidemic changes as illustrated by increasing triglycerides, total cholesterol and low density lipoprotein LDL and a decrease in serum level of high density lipoprotein HDL (Table 2).

Oral administration of MEBP (200 mg/kg b.w) to obese rats resulted in a decreased total cholesterol, triglycerides, LDL-c, but increase in HDL-c. With a MEBP dose of 400 mg/kg body weight, the lipid profiles decreased more significantly while HDL increased considerably. When compared to Sibutramine, the standard antiobesity drug (5 mg/kg body weight for 40 days supplementation), MEBP at 400 mg/kg body weight caused more significant decreases in serum TG,

Table 1: Body weights of rats fed on normal diet (ND) and high fat diets (HFD) and the effect of sibutramine (SBT) and Methanolic extract of *Bauhinia purpurea* (MEBP) on body weight of rats

	Animal groups				
Body weights	ND	HFD	SBT+HFD	MEBP[1] +HFD	MEBP[2] +HFD
Initial body weight (g)	150±4.5	153±3.2	152±0.5	156±1.5	154±5
Final body weight (g)	170±0.78	260±6	185±3	203±0.84	190±0.98

*Values represent mean ± SEM of six rats

ND=Normal diet: HFD=High fat diet: SBT+HFD=Sibutramine+ High fat diet

MEBP[1] +HFD=Methanol extract of *Bauhinia purpurea* (200mg/kg) + High fat diet

MEBP[2] +HFD=Methanol extract of *Bauhinia purpurea* (400mg/kg) + High fat diet

Table 2: Lipid profiles of rats fed on normal diet (ND) and high fat diets (HFD) and the effect of sibutramine (SBT) and Methanolic extract of *Bauhinia purpurea* (MEBP) on them

	Animal groups				
Lipid profile	ND	HFD	SBT +HFD	MEBP[1] +HFD	MEBP[2] +HFD
TG (mg/dl)	84.50 ±5.64	176.2 ±2.650	74.2 ±2.470	68.8 ±3.240	57.34 ±3.12
TC (mg/dl)	83.17 ±4.33	143.65 ±4.67	97.68 ±6.35	94.7 ±3.340	87.3 ±2.230
HDL (mg/dl)	27.6 ±5.700	23.6 ±2.490	37.4 ±6.700	33.4 ±2.340	38.12 ±2.13
LDL (mg/dl)	39.27 ±3.23	84.78 ±2.34	55.44 ±1.24	49.54 ±3.21	39.12 ±2.43

*Values represent mean ± SEM of six rats

ND=Normal diet: HFD=High fat diet: SBT+HFD=Sibutramine+ High fat diet

MEBP[1] +HFD=Methanol extract of *Bauhinia purpurea* (200mg/kg) + High fat diet

MEBP[2] +HFD=Methanol extract of *Bauhinia purpurea* (400mg/kg) + High fat diet

total cholesterol and LDL-$_C$ while there were significant increases in HDL cholesterol in obese rats. Similar reports of antilipidemic effects were earlier noted in *Chamaerops Humilis* leaves, *Bauhinia variegata* [17, 18]. *Bauhinia forficata* and *Bauhinia purpurea* were used for the treatment of experimental diabetes in rats in Alloxan-induced diabetes [8, 9]. Persons with low HDL cholesterol are necessarily at risk of premature coronary diseases as reported by [19, 20]. In our study we report the anti obesity efficacy of *Bauhinia purpurea* in HFD fed rats. Further studies are under way to establish the beneficial effect of *Bauhinia purpurea* in human beings.

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