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Research Article

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Effect of *Phoenix deactylifera* on high fat diet induced obesity

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ABSTRACT

Obesity is a global health Problem, resulting from an energy imbalance caused by an increased ratio of caloric intake to energy expenditure. In recent years, there has been a great increase in the use of herbal medicines for the treatment of obesity. In our study, aqueous extract of phoenix dactylifera was evaluated for their anti hyperlipidaemic efficacy in High fat diet (HFD) induced albino obese rats. HFD induced obesity was well manifested by significant increase in the level of lipid profile like cholesterol, LDL,VLDL, Triglycerides,Free Fatty Acids and decrease the level of HDL. The oral administration of Phoenix dactylifera extract along with High fat diet reversed the altered parameters to normal level which indicates the anti hyperlipidemic efficacy of phoenix dactylifera against HFD. Phytochemical constituents of phoenix dactylifera may be responsible to prevent the obesity. Further extensive studies are required for its potential uses in clinical practice.

Keywords: *Phoenix dactylifera*, High fat diet (HFD), obesity, Antihyperlipidemic.

INTRODUCTION

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems. A person has traditionally been considered to be obese if they are more than 20 percent over their ideal weight. That ideal weight must take into account the person's height, age, sex, and build [1].

Obesity is often multifactorial, based on both genetic and behavioral factors. Accordingly, treatment of obesity usually requires more than just dietary changes. Exercise, counseling and support, and sometimes medication can supplement diet to help patients conquer weight problems. Extreme diets, on the other hand, can actually contribute to increased obesity [2].

Overweight is a significant contributor to health problems. It increases the risk of developing a number of diseases including Type 2 (adult-onset) diabetes, hypertension, myocardial infarction etc [3].

The simple cause is ingestion of more calories than are required for energy, the excess being stored in the body as fat. Inactivity and insufficient exercise can be contributing factors; the less active the person, the fewer calories are needed to maintain normal body weight. Overeating may result from unhealthful patterns of eating established by the family and cultural environment, perhaps exacerbated by psychological distress, an emotional dependence on food, or the omnipresence of high-calorie food [4].

An estimated 97 million adults in the United States are overweight or obese, a condition that substantially raises their risk of morbidity from hypertension, dyslipidemia, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea and respiratory problems, and endometrial, breast, prostate, and colon cancers. Higher body weights are also associated with increases in all-cause mortality. Obese individuals may also suffer

from social stigmatization and discrimination. As the second leading cause of preventable death in the United States today, overweight and obesity pose a major public health challenge [5].

Until recently, obesity was considered the result of a sedentary lifestyle and the chronic ingestion of excess calories. This may be the principal factor for many individuals, but there is evidence of strong genetic, metabolic, and environmental influences in the development of obesity. Certain illnesses, such as Cushing's syndrome or hypothyroidism, and medications, such as glucocorticoids, can also cause obesity. However, less than one percent of all obese patients have an identifiable secondary cause of obesity [6].

Successful programs for weight loss reduction may include exercise, low-fat, high-complex carbohydrate, high fiber diet,behavior modification to change eating behavior,Social support,medications.

Now a day the use of herbal medicine has gained more momentum owing to the general awareness of its safety towards the human systems is comparison to the synthetic drugs.

Keeping, this view, the present study has been undertaken to investigate antihyperlipidemia effects of *phoenix dactylifera* flesh extract against HFD induced obesity in albino wistar rats.

The date palm (*Phoenix dactylifera*) belongs to Euphorbiaceae is one of the oldest cultivated plants on earth and its cultivation is now undertaken in many countries. Moreover, fruits of the Date palm are very commenly consumed in many parts of the world and are a vital component of the diet and a staple food [7]. Although its place of origin is unknown because of long cultivation, it probably originated from lands around the Persian Gulf [8].

Phytochemically the whole plant contains carbohydrates, alkaloids, steroids, flavonoids, vitamins and tannins. The phenolic profile of the plant revealed the presence of mainly cinnamic acids , flavonoid glycosides, flavanols. The Thin layer chromatography (TLC) analysis revealed the presence of steroids namely cholesterol, stigmasterol, campesterol and α-sitosterol. Anthocyanins were detected only in fresh dates [9].

Dates have a high tannin content and are used medicinally as a detersive (having cleansing power) and astringent in intestinal troubles. As an infusion, decoction, syrup, or paste, dates may be administered for sore throat, colds, bronchial cataract, and taken to relieve fever and a number of other complaints. One traditional belief is that it can counteract alcohol intoxication. The seed powder is also used in some traditional medicines. Because of its luxative quality, dates are considered to be good in preventing the Constipation disease.

EXPERIMENTAL SECTION

Collection Of Plant Materials

The plant material *Phoenix dactylifera* were collected from Trichy district which were carefully identified with the help of Regional Floras.

Extraction of Plant Material

Aqueous extract was prepared according to the methodology of Indian Pharmacopoeia. The shady dried flesh was subjected to pulverization to get coarse powder. The coarse powder material was subjected to Soxhlet extraction separately and successively with distilled water. The extract was concentrated to dryness in flash evaporator under reduced pressure and controlled temperature (40-50°C). The Aqueous extract put in air tight containers stored in a refrigerator until used**.**

Chemicals

Cholesterol and lecithin were purchased from Hi Media Laboratories Ltd, Mumbai, India. The reagent kit for high-density lipoprotein (HDL) and total cholesterol estimation was obtained from Span Diagnostics Ltd, Surat, India. All other chemicals and solvents were of analytical grade from standard companies, and the solvents were distilled before use.

Animals

Male Wistar rats weighing about 150-200 g were procured and maintained in the laboratory condition. The animals were fed with standard pellet diet (Kamathenu Agencies, Bangalore, India) and clean water *ad libitum*, and routinely housed in controlled conditions with temperature of 25–26°C, relative humidity of 60–80% and 12-h light/dark cycle. The animals were acclimatized for 2 weeks before experimentation.

Experimental design:
Animals were divided into four groups of six animals each groups. Group- I served as control which received normal diet. Group- II obesity induced by high fat diet (HFD) (200mg/kg b.w.,). Group- III cotreated with high fat diet (200mg/kg b.w.,) and aqueous extract of *Phoenix dactylifera* (100mg/kg b.w.,). Group -IV plant extract (100mg/kg b.w.,) alone.

The High fat diet (HFD) comprised of wheat flour base with addition of milk powder, dried egg yolk, hydrogenated fat, butter, dried yeast, salt, sugar and vitamin mixture.

The animals were maintained in their respective groups, monitored closely daily and weighed every week. Total duration of the experiment was 4 weeks, at the end of which some of the rats were fasted overnight to eliminate chylomicrons, anaesthetized with ketamine hydrochloride (30 mg/kg body weight i.p.), and then sacrificed by cervical decapitation. Blood was collected in tubes containing ethylene diamine tetra acetic acid (1 mg/mL), and plasma was obtained by centrifuging the blood (1500 ¥ g, 15 min, 4C). Samples were stored at -60^{0}C until analyzed.
Statistical Analysis

All the grouped data were evaluated statistically and significance of changes was determined using one-way analysis of variance (ANOVA) followed by Duncan's multiple range test (DMRT) using SPSS version 11.0 for windows. The values are considered statistically significant if the P value was less than 0.05 and 0.005.

RESULTS AND DISCUSSION

Ayurvedic clsassics give sufficient focus on obesity and serves as a guideline to advice diet etc. present or to control the disease obesity is not limited to developed countries but it is spreading globally. Traditionally, obsesity was believed to be associated with life, several studies have shown that changes in dietary pattern, physical activity levels, life styles are related to increasing frequencies of obesity and the risk of associated diseases. Our work conducted on the Medicinal plant *Phoenix dactylifera* having anti obesity properties.

Phytochemical results showed that the presence of Flavonoids, Alkoloids, volatile oil, Sugar, Tannins, Coumarins, quinones and Phenols (Table 1). The lipid lowering effects of *Phoenix dactylifera* may be due to its content of plant sterols [10]. (campasterol , fucostrel,etc.) and fixed oil, which is considered as good sour5ce of mono- and poly-unsaturated fatty acids and cardic aglycones. Plant sterol reduces the absorption of cholesterol and thus increasers the fecal excretion of steroids that results in decrease of body lipids[11]. Secondary plant metabolites such as flavonoids,saponins and polyphenolics from polar extracts may be responsible for the antiyperlipidemic activity. Flavonids from Phoenix dactylifera may augment the activity of lecithin acyl transferase (LCAT),which regulates blood lipids. LCAT plays a key role in the incorporation of free cholesterol into HDL (this may increase HDL) and transferring it back to VLDL and LDL which are taken back later in liver cells. Several studies have showed that increase in HDL-C is associated with decrease in CAD [11,12,13,].

Body weight increased significantly in rats fed on HFD compared with controls (fed on normal diet) (Table 2). Treatment with Phoenix dactylifera reduced body weight of HFD fed obese rats. Similar reports of reduction in body weight were earlier observed in human/rats with *chamaerops humitis* leaves and *Bauhinia purpurea* bark[14]. Cholesterol is essential for human life. It builds and repair cells and it is used to produce sex hormones like estrogen and testosterone. It is converted to bile acids to help digestion and formation of vitamin D on the skin's surface and it is found in large amount in brain and nerve tissue. Blood cholesterol elevation is due to some external disturbance of lipid metabolism [15].

Table 3 shows the reduced plasma level of cholesterol remarkably on treating HFD treated rat with aqeous extract of *phoenix dactylifera* when compared to high fat diet treated group and it may be due to the inhibition of hepatic cholesterogensis or due to the increased excretion of fecal sterols.

The decrease in serum TG level is an important finding of this experiment (Table 3). Recent studies show that triglycerides are independently related with coronary heart disease[16]. Most of the hypolipidaemic drugs do not decrease serum triglycerides level. This effect may be related to increase in the endothelium bound lipoprotein lipase activity that hydrolyses the triglycerides into fatty acids. These result demonstrate strong hypolipidaemic impacts of *Phoenixdactylifera.* Regarding the mechanism of action these plant extracts may have caused decrease in serum cholesterol and triglycerides [17].

Increased level of plasma free fattyacids were observed in HFD rats as compared to the control rats (Table 3). This significant increase of free fattyacids may be due to the breakdown of membrane phospholipids by the action of

oxygen derived free radicals induced during hyperlipidaemia or may be due to the increased activity of phospholipase A [18]. Treatment with Phoenixdactylifera extract decreased the free fattyacid concentration.

A rise in LDL may cause deposition of cholesterol in the arteries and aorta and hence it is a direct risk factor for coronary heart disease[19,20]. The search for hypolipidaemic drugs follows rationale that high levels of serum cholesterol are associated with an increased incidence of coronary heart diseases. Reduction in LDL cholesterol and increase in HDL cholesterol concentration are significantly related to lipid lowering therapy.

In the present study, the *Phoenix dactylifera* extract feeding resulted in significant reduction in LDL cholesterol level (Table 4). Elevated LDL levels promote atherosclerosis and other cardiovascular disease [21]. LDL carries cholesterol from the liver to the peripheral cells and smooth muscle cells of the arteries.

A significant fall in the HDL cholesterol to total cholesterol ratio was observed in HFD rats (Group II) (Table 4). Low level of HDL is associated with high risk of coronary artery disease [22]. *Phonenix dactylifera* extracts feeding brought back this ratio to normal by increasing HDL concentration. HDL participated in reverse cholesterol transport transferring cholesterol from tissues back to the liver. This action aids the efflux of cholesterol from the arterial wall. HDL may also influence atherosclerosis by carrying enzymes that are antioxidants, which may block early steps in atherogenesis and slow progression of lesions [20].

Table 4 shows increased concentration of VLDL in plasma of HFD treated rats when compared with the control treatment with *phoenix dactylifera* extract reduced VLDL level significantly VLDL in highly rich in triglycerides and is involved in the transport of triglycerides from liver to extrahepatic tissues where as LDL is mainly formed from VLDL in presence of heparin releasable lipoprotein lipase, an enzyme present in the endothelial cells of the blood vessel walls. Studies show that both LDL and VLDL have positive roll in atherogenesis [23] reduced level of LDL in *phoenix dactylifera* on HFD fed rats may be possibly due to increase with Catabolism of LDL.

Table1: Phytochemical Analysis of *Phoenix Dactylifera*

Phytochemical constituents	Result of qualitative tests
Alkaloids	+
Terpenoids	-
Coumarins	+
Tannins	+
Flavonoids	+
Phenolic compound	+
Volatile oil	+
Quinones	+
Sugar	+

(+) positive result (-) negative result

Table2: Effect of *Phoenix Dactylifera on* body weight

Groups	Treatments	Bodyweight(gms)
Group I	Control	25 ±2
Group II	High fat diet	38 ± 1
Group III	High fat diet+Plant extract	24 ±3*
Group IV	Plant extract alone	30 ± 2**

Values are given as mean ± SD for 6 rat in each group.
**P<0.05 as compared with HFD treated group.*
***P<0.005 as compared with HFD treated group.*

Like many spcies *Phoenixdactylifera* may stimulate hepatic micrsomal cytochrome p450 dependent aryl hydrolase activity which is believed to be involved in the hydroxylation of endogenous steroids such as cholesterol and there by increases the catabolic conservation of cholesterol to bile acids in liver [24].

On basis of above results, it can be concluded that aqueous extract of *Phoenix dactylifera* is a valuable diet against obesity.

The antihyperlipidimic activity of *Phoenix dactylifera* may be due to phyrochemical constituents present in it. Further extensive studies are required for its potential uses as a antihyperlipidimic drug in clinical practice.

Table 3: Effect of *Phoenix Dactylifera on* lipid profiles

Groups	Treatments	Serum cholesterol (mg/dl)	Serum trigylcerides (mg/dl)	Free fatty acids (mg/dl)
Group I	Control	83.0 ± 0.6	18.5 ± 2.9	18.5 ±2.9
Group II	High fat diet	156.1 ±0.4	22.06 ± 0.5	17.66 ±4.0
Group III	High fat diet+ Plant extract	84.3 ± 1.6*	18. 7 ±0.2**	18. 6 ±3.0**
Group IV	Plant extract alone	125.9±6.0**	20.0±0.7*	18. 96 ±3.9*

Values are given as mean ± SD for 6 rat in each group.
**P<0.05 as compared with HFD treated group.*
***P<0.005 as compared with HFD treated group.*

Table 4: Effect of *Phoenix Dactylifera on* lipid profiles

Groups	Treatments	Serum HDL (mg/dl)	Serum LDL (mg/dl)	Serum VLDL (mg/dl)
Group I	Control	58.3 ± 0.4	27.5 ±1.8	10.5 ±0.9
Group II	High fat diet	39.6 ±0.1	94.3 ± 0.3	12.3 ±0.7
Group III	High fat diet + Plant extract	56.4 ± 0.71**	31.5 ±0.6**	10. 5 ±0.8*
Group IV	Plant extract alone	56.0±0.5*	80.2±0.5*	10.4 ±0.9*

Value diet s are given as mean ± SD for 6 rat in each group.
**P<0.05 as compared with HFD treated group.*
***P<0.005 as compared with HFD treated group.*

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