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EFFECT OF CARALLUMA FIMBRIATA EXTRACT ON APPETITE & LIPID PROFILE IN RATS FED WITH HYPERCALORIE/CAFETERIA DIET

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ABSTRACT

Objectives: To study the Effect of *Caralluma Fimbriata* extract (CFE) on appetite & lipid profile in rats fed with hypercalorie/cafeteria diet. Methods: Wistar rats weighing 180-240g were randomly divided into three groups (n=6 each); i) Control, ii) Cafeteria Diet (CD), and iii) Cafeteria diet + CFE. CFE was administered at 100 mg/kg/day p.o. for 50 days. Food intake, animal's bodyweight, blood glucose, serum lipid levels were measured –at baseline, every 10 days and at term. Liver Function Tests & Renal Function Tests were measured at baseline and at term. Results: Treatment with CFE at a dose of 100 mg/kg/day significantly (P <0.05) reduced the increase in body weight and lipid profile levels as compared to the CD control group. Conclusions: *Caralluma fimbriata* extract prevented gain in body and alterations in lipid profile caused by Cafeteria Diet. Hence, this agent might be useful in treatment of obesity.

KEYWORDS: **Cafeteria Diet, Caralluma fimbriata extract, Wistar rats, Blood glucose.**

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INTRODUCTION

Obesity is multifactorial, and it is reaching epidemic proportions. It is a causal factor in chronic conditions like diabetes, atherosclerosis, hypertension, bone disorders, endocrine dysfunction and other ailments. The adverse clinical consequences of obesity are so harmful that a 20% increase above the ideal weight is associated with a 20% increase in the mortality rate[1]. Obesity may be defined as excess weight with a body mass index (BMI) greater than 30 kg/m^2. Obesity may be induced in experimental animals by variety of methods, eg; neuroendocrine, dietary or genetic changes[2]. The animals enable us to obtain answers in a short time, since 10 days in the life of a rat is approximately 1year in humans when comparing changes in body weight. In traditional medicine various herbal extracts have been found useful in management of obesity. *Caralluma fimbriata* is one such herb. Hence, we have selected it for present study. The effect of *Caralluma fimbriata* extract of the whole plant is evaluated on appetite & lipid profile in rats fed with hyper-calorie/cafeteria diet and its antiobesity effect is observed.

MATERIALS & METHODS

Wistar rats weighing 180-240g either sex bred from a stock obtained from the Central Animal House, BLDEU's Sri BM Patil Medical College Hospital & Research Center, Bijapur, India, were used in the study. Animals were housed in quarantine room individually in polypropylene cages for one week of acclimation before the experiment started. The study was approved by the Institutional Animal Ethics Committee (IAEC). The *Caralluma fimbriata* extract (30% dry extract) was prepared and gifted by Digvijay Pharmaceuticals (I) Ltd, Thane (W), Maharashtra, India.

(i) Hypercalorie/Cafeteria diet[3, 4]

It consisted of 3 variants, i) condensed milk + bread + peanuts + pellet chow (4:1:4:1), ii) chocolate + biscuits + dried coconut + pellet chow (3:2:4:1), and iii) cheese + boiled potatoes + pellet chow (4:2:1). The different variants were presented on alternate days throughout the treatment period.

(ii) Experimental Design

Animals were randomly divided into three groups (n=6 each); i) Control, ii) Cafeteria Diet (CD), and iii) Cafeteria diet + *Caralluma fimbriata* extract (CD+CFE) treated. Rats in the control group were fed standard pellet chow, while rats in the cafeteria diet and CD + CFE treatment groups received both pellet chow and cafeteria diet. CFE was administered in the dose of 100 mg/kg/day p.o. for 50 days. Group iii animals received cafeteria diet and CFE from day one. The appetite suppressing activity of CFE was calculated by monitoring food intake and animal's body weight (at baseline, every 10 days and at term). Laboratory parameters included blood glucose, serum lipid profile (including cholesterol, triglycerides and high density lipoprotein), which were measured –at baseline, every 10 days and at term. In addition, liver function and renal function were assessed by SGOT, SGPT, ALP, Creatinine, uric acid and blood urea. These tests were done at baseline and at term.

(iii) Data Analysis

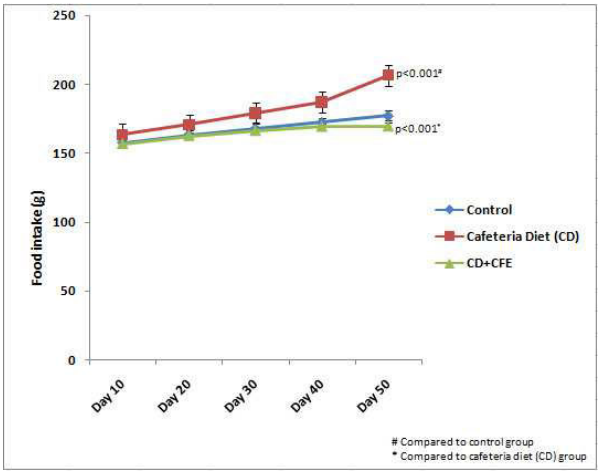
All the values were analyzed by one-way analysis of variance (ANOVA) using the Brown-Forsythe statistic followed by Games-Howell post hoc comparisons tests to test differences between groups. The level of statistical significance was set at $p<0.05$.

RESULTS

(i) Food intake

Food intake was monitored in animals for 50 days (Graph 1). Food intake was significantly ($p<0.001$) greater in cafeteria diet fed groups than in the group given pellet chow (control). Concurrent administration of CFE with cafeteria diet reduced food intake significantly ($p<0.001$) compared to cafeteria diet group.

Graph 1
Food intake in grams over 50 days



(ii) Body Weight

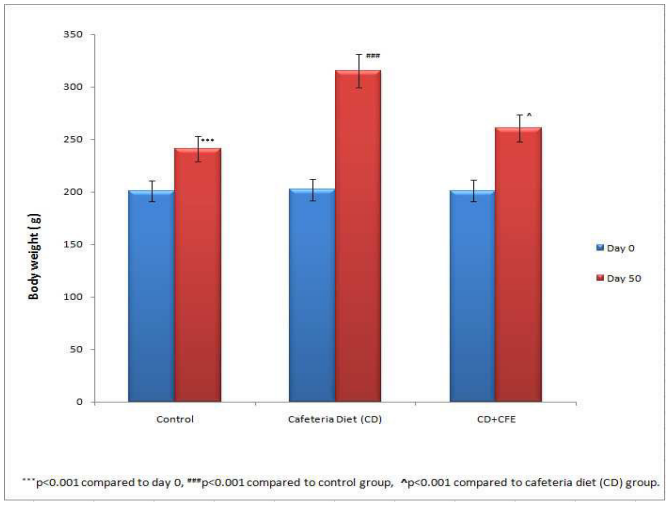
Animals in the all the groups gained body weight (Table 1). However, weight gain was significantly ($p<0.001$) more in the cafeteria diet group as compared to control group. Rats in CD + CFE group gained body weight similar to those in the control group. This weight gain was significantly ($p<0.001$) less than those in the cafeteria diet group (Graph 2)

Table 1
Gain in body weight in grams over 50 days

Group	Day 0	Day 10	Day 20	Day 30	Day 40	Day 50
Control	201± 1.17	213±1.38	222±1.87	230±2.59	237±2.16	241±2.41
Cafeteria Diet (CD)	202±3.05	226±2.36**	244±3.44***	267±3.46***	286±2.22***	315±2.24***
CD+CFE	201±3.96	219±3.96	228±4.19$^{\#}$	241±4.19$^{\#\#}$	252±4.89$^{\#\#\#}$	261±5.42$^{\#\#\#}$

***p<0.05, **p<0.01, ***p<0.001 compared to control group.*
$^{\#}$p<0.05, $^{\#\#}$p<0.01, $^{\#\#\#}$p<0.001 compared to cafeteria diet (CD) group.

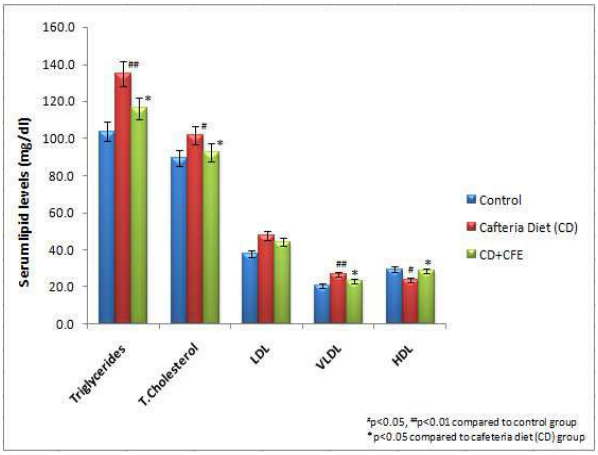
Graph 2
Gain in body weight in 50 days



(iii) Serum lipid profile

Feeding of cafeteria diet produced a significant increase in serum total cholesterol, triglycerides, and VLDL levels, compared to those in untreated control group. This increase was prevented in CD+CFE group (Graph 3). On the other hand, HDL levels decreased in cafeteria fed rats, while CFE treatment ameliorated this effect.

Graph 3
Serum lipid levels in different groups at day 50



(iv) Blood glucose

There was a significant ($p<0.05$) rise in blood sugar in cafeteria diet group in comparison with untreated control. Blood sugar was increased in CFE treated animals but not significantly.

(v) *Liver Function Tests*

The levels of SGPT, SGOT and ALP did not show significant change in all the groups.

(vi) *Renal Function Tests*

In cafeteria diet fed rats, there was significant ($p<0.05$) increase in serum creatinine and uric acid levels at day 50. However, there was no significant change in blood urea level. CFE treatment abrogated these changes (Table 2).

Table 2
Renal function tests

Group	SERUM CREATININE	URIC ACID	BLOOD UREA
Control	0.7±0.4	3.0±0.03	50.2±2.1
Cafeteria Diet (CD)	0.9±0.3*	3.9±0.15**	42.0±3.0
CD+CFE	0.7±0.3#	3.0±0.05##	52.2±1.6#

*$p<0.05$, **$p<0.01$ compared to control group,
#$p<0.05$, ##$p<0.001$ compared to cafeteria diet (CD) group.

DISCUSSION

Cafeteria diet induced obesity (DIO) is a widely accepted model for obesity as high fat diet inevitably causes hyper-phagia resulting in increased body weight. It simulates clinical obesity. This gain in body weight is largely due to increased fat mass as a result of preadipocyte proliferation and differentiation and, to an extent, accumulation of lipids in the liver[5,6]. Our results

show that CFE has appetite suppressant and anti-obesogenic effects in this model. These effects were reflected in the intake of food, body weight and serum lipid profile in the rats treated with CFE. This reveals that concurrent administration of CFE with cafeteria diet prevents the rats from becoming obese. Two clinical trials of the CFE also found no adverse effects[7,8]. Pregnane glycosides present in CFE may act via multiple mechanisms. The decline in food intake may reflect direct intervention in appetite control at the level of the hypothalamus, where the pregnane glycosides are known to act[9]. There is also evidence that the pregnane glycosides act directly on adipose tissue, by inhibiting adipocyte proliferation and differentiation[10-12]. An alternative hypothesis is that CFE may down regulate ghrelin synthesis in the stomach and subsequently neuropeptide-Y in the hypothalamus, with ultimately the same effect of appetite suppression[13-16].

CONCLUSION

Obesity induced by cafeteria diet in animals is an accepted model of obesity. The *Caralluma fimbriata* extract prevented gain in body weight and alterations in lipid profile in this model. Hence, this agent might be useful in treatment of obesity.

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