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Research Article

Evaluation of Anti-Obesity Activity of *Convolvulus pluricaulis* Extract

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ABSTRACT

In modern era obesity is consider as lifestyle disorder which can trigger several disease. Obesity may leads to hypertension, type-2 diabetes mellitus, endocrinal abnormalities, dyslipidaemia, sleep apnoea, osteoarthritis, and higher mortality from some cancer like oesophagus, colon rectum and breast. At present only two drugs have been approved for long term use in the treatment of obesity that is sibutramine and orlistat. These drugs show best result when taken in adjunction to diet, exercise and behaviour changes regimens. But these drugs are unable to cure obesity and weight is regained when discontinued. That's why there is urge to search an anti-obesity medicine which can be used without any side effect. In present study anti-obesity effect of extract of *Convolvulus pluricaulis* is evaluated in mice feed with cafeteria diet (CD). Obesity was induced in mice by feeding them a CD daily for 41 days in addition to normal diet. Body weight and food intake was measured initially and then every week thereafter. On day 41, serum biochemical parameter were measured and animal were sacrificed using overdose of ether. The liver kidney, heart and spleen were removed and weighed immediately. CD may leads to obesity in mice however standard (Sibutramine). Treatment with extracts of *Convolvulus pluricaulis* caused changes in the blood parameter including decease levels of total cholesterol (TC), low density lipoprotein cholesterol (LDL-C) and TG but increased high density lipoprotein cholesterol (HDL-C). Methanolic extract of *Convolvulus pluricaulis* is a potential source of anti-obesity phytomedicine.

Keywords: Anti-obesity, *Convolvulus pluricaulis*, Shankhpushpi, Obesity, Phytomedicine.

INTRODUCTION

Obesity is a medical condition of excess adipose tissue mass, however in current scenario obesity is considered with regards to the appearance rather than the consciousness of the health.[1,2] Most health care professional agree that men with more than 25% body fat and women with 30% body fat are considered to be obese.[3] Obesity may leads to hypertension, type-2 diabetes mellitus, endocrinal abnormalities, dyslipidaemia, sleep apnoea, osteoarthritis, and higher mortality from some cancer like oesophagus, colon rectum and breast.[1,4,5] Obesity can be controlled by primary measure like dietary restriction and exercise.[6] Exercise and diet restriction are unable to control the obesity in chronic condition that's why there is need for pharmacotherapy as adjunct to life style changes.[4] The dietary habit of western world may leads to obesity due to lack of fruits, vegetables and omega-3 fatty acids.[7] At present only two drugs have been approved for long term use in the treatment of obesity that is sibutramine and orlistat. These drugs show best result when taken in adjunction to diet, exercise and behaviour changes regimens. But these drugs are unable to cure obesity and weight is regained when discontinued.[8] Sibutramine inhibits to 5 HT and NA may leads to 4-6% weight loss after one year treatment but has adverse cardiovascular side effect like slight increase in blood pressure, heart rate which restrict its use in obese patient with coexisting cardiovascular morbidity.[9] Orlistat is a lipase inhibitor which reduces fat absorption from intestine and reduces obesity. Orlistat is the choice of drug but it is associated with following side effect loose stool, oily stool and abdominal pain.[10] In many cases patient discontinue the medicine due to severe side effect. From the history of civilization herbal medicines were used to cure human aliments in every possible condition. In modern era we have the option to use them over the synthetic molecules because herbal drugs have lesser side effects.[11] Thus there is need of search of effective anti-obesity medicine which is safe. Most of the ant obesity medicine act over CNS to supress appetite and reduce food intake.[12] Phenolic compounds are reported to possess antioxidant property which may leads to decrease in obesity. Traditional and alternative medicine play an important role in the management of obesity as they were developed from the experience of people which passed from one generation to next since history of civilisation.[13] The whole part *Convolvulus pluricaulis* belonging to family convolvaceae is used in traditional system of medicine. From ancient time Shankhpushpi had been used as brain tonic, memory enhancing drug.[14,15] The anti-obesity activity of this plant

Table 1: Composition of Cafeteria diet

Cafeteria diet	
Diet 1	Condensed milk (40 g) + Bread (40 g)
Diet 2	Chocolate (15g) + Biscuits (30 g) + Dried coconut (30 g)
Diet 3	Cheese (40 g) + Boiled potatoes (50 g)

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Table 2: Experimental groups and their respective treatments

Group name	Treatment name	Dose of treatment	No. of animal in a group
Test 1	Methanolic extract	200 mg/kg	5
Test 2	Aqueous extract	200 mg/kg	5
Test 3	Chloroform extract	200 mg/kg	5
Standard	Sibutramine	200 mg/kg	5
Control	Vehicle (distilled water + 1% Tween 80)	200 mg/kg	5

Table 3: Change in Body weight at different time intervals of the study (mean ± SEM)

Days	Sibutramine	Methanol	Aqueous	Chloroform	Control
1	0	0	0	0	0
3	0.6±0.244	1±00	1.2±0.200	0.7±0.152	0.6±0.244
5	1.2±0.374	2.2±0.374	2.2±0.200	1.6±0.266	2±0.447
7	1.8±0.200	2.8±0.200	3.4±0.244	2.6±0.339	2.8±0.374
9	2.6±0.244	3.8±0.489	4.2±0.374	3.6±0.426	4.4±0.244
11	3±00	4.2±0.663	4.6±0.244	4.6±0.581	5.2±0.200
13	3.8±0.200	4.8±0.488	5.8±0.200	5.6±0.636	6.4±0.400
15	4.2±0.200	6±0.447	6.6±0.509	6.3±0.731	6.8±0.374
17	4.4±0.244	6.8±0.489	7.8±0.583	6.8±0.879	7.8±0.374
19	5.2±0.374	7.6±0.509	8.6±0.509	8±1.022	8.8±0.200
21	5.8±0.374	8.4±0.244	9±0.547	9±1.174	10.2±0.374
23	6.2±0.374	9±0.316	10.2±0.583	9.7±1.230	11.4±0.244
25	6.6±0.509	9±0.316	11.6±0.509	10.8±1.497	12.2±0.374
27	7.2±0.489	9.8±0.374	12.6±0.600	11.7±1.571	13.2±0.374
29	7.6±0.400	10.4±0.244	13.2±0.583	12.4±1.648	13.6±0.244
31	8±0.447	10.8±0.374	14±0.547	13.4±1.869	14.4±0.244
33	8.6±0.509	11.8±0.489	14.8±0.583	14.2±1.937	15.4±0.400
35	9±0.447	12.2±0.374	15.4±0.400	15±2.055	16.2±0.489
37	9.2±0.583	12.2±0.374	16.2±0.374	15.5±2.146	16.8±0.583
39	9.4±0.509	12.6±0.400	16.4±0.509	15.8±2.169	16.8±0.583

is not reported however this drug also acts over CNS. More over from ancient time this herb is used, and no serious

side effect is reported till date. To consider these facts an attempt has been taken to evaluate anti-obesity activity of *Convolvulus plauricalis.*

MATERIALS AND METHODS

Procurement and authentication of plant material: The plant is collected in month of December from Phagwara Punjab and identified from NISCAIR (Ref. NISCAIR/RHMD/Consult/-2010-11/1569/167)

Experimental animals: Wistar albino mice were considered as animal model for the present study. Twenty five male albino mice (28 to 35 g) were procured from National Institute of Pharmaceutical Education and Research after the approval of experimental procedure by Institutional Animal Ethical Committee (approval number 954/90/00/CPCSEA/11/1).

Housing of animals: Animals were divided in five groups. Each group was containing five animals. Animals were kept individually in polyacrylic cages and were exposed to 12:12 light dark cycles with an average temperature of 25 $\pm$ 2˚C and humidity 55 to 65%

Feeding of animals: Mice were fed with commercial pelleted diet (M/s Hindustan Lever Ltd., Bangalore, India) and free access of water. In addition they were feed with cafeteria diet as mention in Table 1. Diets were made available to each group in order of 1, 2, 3 and then repeated consecutively in same manner.

Preparation of extract: The plant was washed with tapped water, spread over paper and air dried under shade. The dried plant was powder using grinder and subjected to soxhlet extraction using methanol and chloroform separately however aqueous extract is prepared by using reflux.[16-21.]

Selection of Dose

Preparation and administration of doses: Accurately weighed dried extracted were dissolved in distilled water containing 1% Tween 80. Volume was made up to the mark using calibrated volumetric flasks. Prepared doses were per orally administered to different groups.

Evaluation of Anti-obesity activity of extracts: Five groups of Wistar albino mice were separately treated in manner described in Table 2, so as to evaluate anti-obesity activity of prepared extracts.

Body weight analysis: Body weight of all the animals in each group were recorded on day 1 and then on alternative days up to 40 days.

Body temperature analysis: Alteration in body temperature after administration of prepared doses at different time intervals (0, 30, 60, 90, 120 and 180 minutes) were analysed by using rectal telethermometer.

Locomotor activity: Alteration in locomotor activity of animals after 30 minutes of dose administration was recorded using open field behaviour test apparatus on 40th day of study. Apparatus was consisting of circular wooden arena having a diameter of 75 cm and a wall height of 25 cm. Animal was placed in the centre of the circle.

Table 4: Alteration in body temperature after administration of extracts, control and standard.

Extracts	0 minutes	30 minutes	60 minutes	90 minutes	120 minutes	180 minutes
Sibutramine	36.33±0.067	36.17±0.203	36.72±0.073	36.87±0.052	36.36±0.099	36.04±0.418
Methanol	36.17±0.169 (ns)	36.31±0.142 (ns)	36.66±0.126 (ns)	36.8±0.125 (ns)	36.36±0.103 (ns)	36.24±0.074 (ns)
Aqueous	36.05±0.078 (***)	36.07±0.061 (***)	36.20±0.104 (***)	36.34±0.139 (***)	36.11±0.093 (***)	35.90±0.116 (***)
Chloroform	35.19±0.034 (ns)	35.37±0.108 (ns)	35.20±0.077 (ns)	35.38±0.122 (ns)	35.62±0.135 (ns)	35.47±0.108 (ns)
Control	35.79±0.243 (ns)	35.67±0.214 (**)	35.92±0.310 (*)	35.62±0.153 (***)	35.84±0.169 (*)	35.57±0.043 (***)

*[ns= not significant; *= p<0.05; **= p<0.01; ***=p<0.001]*

Table 5: Alteration in locomotor activity after administration of extracts, control and standard.

Extracts	Rearing	Ambulation	Grooming
Sibutramine	31.2±0.583	33.2±1.281	18.2±1.281
Methanol	30.2±0.860 (ns)	32±1.581 (ns)	9±0.707 (***)
Aqueous	17.8±1.068 (***)	16.2±1.068 (***)	6.6±0.509 (***)
Chloroform	21.6±0.509 (***)	15.2±0.663 (***)	9±0.707 (***)
Control	19.6±0.812 (***)	16.2±1.068 (***)	8±0.447 (***)

[*= p<0.05; **= p<0.01; ***=p<0.001]

Table 6: Alteration in organ weight after administration of extracts, control and standard

Extracts	Heart	Liver	Kidney Left	Kidney Right	Spleen
Sibutramine	0.185±0.016	1.061±0.053	0.178±0.004	0.187±0.009	0.184±0.007
Methanol	0.185±0.020 (ns)	1.582±0.060 (**)	0.184±0.020 (ns)	0.212±0.012 (ns)	0.176±0.016 (ns)
Aqueous	0.24±0.008 (ns)	1.797±0.094 (**)	0.301±0.007 (***)	0.309±0.007 (***)	0.257±0.027 (ns)
Chloroform	0.264±0.027 (*)	2.047±0.060 (***)	0.288±0.028 (**)	0.311±0.017 (***)	0.275±0.033 (**)
Control	0.342±0.013 (***)	2.338±0.077 (***)	0.366±0.019 (***)	0.363±0.019 (***)	0.314±0.007 (*)

*[ns= not significant; *= p<0.05; **= p<0.01; ***=p<0.001]*

Table 7: Alteration in biochemical parameters after administration of extracts, control and standard

Biochemical Parameter	Sibutramine	Methanol	Aqueous	Chloroform	Control
Total blood glucose level	42.68±5.425	64.64±3.931 (ns)	70.28±6.786 (ns)	107.14±15.477 (**)	80.36±5.148 (*)
Total cholestrol level	98.18±8599	93.46±9.446 (ns)	113.34±15.373 (ns)	89.72±17.575 (ns)	125.8±9.401 (ns)
Total Triglyceride level	30.14±2.710	37.78±3.948 (ns)	39.46±4.961 (ns)	85.22±1.164 (**)	62.58±8.287 (*)
HDL level	55.67±5.392	53.04±4.889 (ns)	43.30±2.794 (ns)	40±3.333 (*)	38.12±1.756 (*)
LDL level	41.52±13.26	42.66±3.551 (ns)	62,14±15.279 (ns)	54.21±9.447 (ns)	61.25±6.875 (ns)
VLDL level	5.794±0.627	7.65±0.832 (ns)	30.58±11.53 (*)	18.57±2.461 (ns)	11.1±3.374 (ns)

*[ns= not significant; *= p<0.05; **= p<0.01; ***=p<0.001*

Ambulatory activity, rearing and grooming activity was recorded for 5 minutes.

Organ weight analysis: At the end of the study animals were sacrificed by cervical dislocation and different organs (kidney, liver, heart and spleen) were immediately removed and were weighed.

Biochemical parameter analysis: Blood samples were withdrawn from the animals on 41st day and were centrifuged to obtain the serum samples. Serum samples were analysed using commercial biochemical kits (Erba Company) so as to analyse levels of blood glucose, total cholesterol, triglycerides, High Density Lipoproteins (HDLs), Low Density Lipoproteins (LDLs), and Very Low Density Lipoproteins (VLDLs). All analysis was performed using biochemical auto analysers.

Statistical analysis: Whole data was expressed as Mean ± SEM. All extract (Test) were compared with Control using one way analysis of variance (ANOVA) followed by Dunnet test.

RESULTS

Phytochemical screening of extract shows the presence of alkaloid, phenolic compound, flavonoids, resin and carbohydrate. DCM extract shows the presence of alkaloids, phenolic compound, flavonoids. Methanolic extract shows the presence of alkaloids, phenolic compound, flavonoids and resin. And aqueous extract

shows the presence of carbohydrate, phenolic compound and flavonoids.

Body weight analysis: Table 3, depicts increase in body weight of all the animals during the period of 40 days. There was no statistically significant difference in results of methanolic extract and the standard drug i.e. sibutramine. Remaining extract (aqueous and chloroform) showed significant difference with respect to standard drug solution.

Body temperature analysis: Except chloroform extract, all other didn't cause statistically significant alteration in body temperature in comparison to control group as shown in Table 4.

Locomotor activity: Only methanolic extract doesn't show any significant difference with respect to control group. Grooming activity of all the groups got significantly altered after extract administration as shown inTable 5.

Organ weight analysis: Methanolic and aqueous extract doesn't show any significant alteration in weight of Heart and spleen with respect to control (Table 6). Aqueous and chloroform extract cause statistically significant change in the weight of right and left kidney (Table 6) at specified level of significance. All the extracts cause significant alteration in weight of liver with respect to sibutramine (Table 6).

Biochemical parameter analysis: Change in blood glucose level, As shown in Table 7, only methanolic extract didn't cause any significant increase in blood glucose (mg/dl) levels with respect to control.

Change in total cholesterol and Triglyceride levels: No extract cause significant change in total cholesterol and triglyceride level of blood (mg/dl) in comparison to sibutramine as shown in Table 7.

Change in serum HDL level**:** Only chloroform extract show significantly lower serum HDL levels with respect to sibutramine (Table 7) at specified level of significance.

Change in serum LDL level: None of the extract showed statistically significant change in serum LDL levels in comparison to control (Table 7) at specified significance level.

Change in serum VLDL level: Aqueous extract cause statistically significant increase in serum levels of VLDL with respect to sibutramine (Table 7).

DISCUSSION

In this study it is very clear that administration of cafeteria diet may leads to obesity. Administration of extracts of *Convolvulus pluricaulis* significantly reduce the increase in body weight in mice by cafeteria diet which is a clear indication of anti-obesity activity. The anti-obesity activity may be due to effect of *Convolvulus pluricaulis* on CNS. Significant increase in serum lipid such as total cholesterol (TC), (LDL-C) and triglycerides (TG) is observed in obese animals. One the other hand there is decrease in HDL/LDL ratio. So alteration of lipid profile can be used as an index of obesity. Treatment with extracts of *Convolvulus pluricaulis* caused changes in the blood parameter including decease levels of TC, LDL-C and TG but increased HDL-C. The methanolic extract shows prominent action which is comparable to sibutramine for locomotors activity with special reference to rearing, ambulance and grooming. Among all extracts only methanolic extract didn't cause any significant increase in blood glucose (mg/dl) levels with respect to control. On the basis of above performed experiment it was concluded that methanolic extract of *Convolvulus pluricaulis* is a potential source of anti-obesity phytomedicine.

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