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EVALUATION OF ANTIOBESITY ACTIVITY OF *SESAMUM INDICUM* LINN. IN HIGH FAT DIET INDUCED OBESITY IN RATS

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ABSTRACT

In the present study methanolic extract of *Sesamum indicum* Linn. (MESI) was carried out to investigate to the explore the effect MESI 200 & 400 mg/kg p.o. on energy balance disorders like obesity, Hyperphagia, Hyperglycaemia and Hyperlipidemia. Obesity was induced by administration of hypercaloric diet for 40 days from the observations of study it could be predicted that methanolic extract of *Sesamum indicum* exerted significant anti obese activity due to its Hypophagic. Hyperglycemic and Hypolipidemic effect in rats fed on high fat diet. The present pharmacological investigation revealed MESI elicted significant decrease body weight, food intake serum levels of glucose, protein, total cholesterol, LDL,VLDL,TG and increased HDL level.

Key words: *Sesamum indicum*, High fat diet, Body weight, Lipid profile.

INTRODUCTION

Obesity is now days a common and challenging health problem. The world health organization has described its an escalating epidemic and one of the greatest neglected public health problem .among the multiple factors contributing to its etiology the sedentary life styles white collar jobs and lack of exercise, psychological factors and the consumption of energy rich diets are the major causes. Obesity is also known to be risk factor for the development of metabolic disorders, dyslipidemia, atherosclerosis and type II diabetes (Larson *et al.*, 1981; Hartz *et al*., 1983). Further the cause of concern is the non availability of drugs for its treatment and short term efficacy and the limiting side effects of available drugs in recent years there has been a great increase in the use of herbal medicines for the treatment for obesity (Sharpe et al., 2007)

Sesamum indicum Linn. (famil: Pedaliaceae) is one of the oldest cultivated plants in the world. It is a pharmaceutically important plant specially its seeds which accumulates a variety secondary metabolites including phenolic compounds, terpenes and steroids for which its used traditionally as herbal medication for many years both for the benefits of whole body and also cosmetic preparation as a free radical scavenger. Beside seeds the other parts of plant are also useful like wound healing activity (Kiran and Mohammed Asad, 2008), analgesic activity (Nahar and Rokonuzzaman, 2009), flowers (cancer, alopecia, and constipation), roots (antifungal activity) (Rehane Syad and Peter Karlvosky 2010) and leaves (infant cholera, diarrhoea, dysentery, and for urinary infections). Sesamin and sesamolin, two unique phytoconstituents isolated from seeds, possess excellent cholesterol-lowering effect in humans and prevents high blood pressure. They serve as a good source of copper, manganese and calcium which are effective in reducing pain, in osteoporosis (Chakraborthy *et al.*, 2008).

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MATERIALS AND METHODS

Plant material

The plant of *Sesamum indicum* was collected from surroundings of Warangal, and it was authentified by Prof. V.S.Raju. Senior Professor, Department of Botany and Plant anatomy research center, Kakatiya University, Warangal, Andra Pradesh.

Preparation of Plant Extract

The aerial parts of *Sesamum indicum* was cleaned and chopped into small pieces and dried under shade. The coarse powder by mechanical grinding. The powdered material 100 g was subjected to continuous hot extraction in soxhlet apparatus at a temperature of (60-70^0 c) by using methanol as solvent. After completion of extraction, the extract was dried by using rotary evaporator. The yield was about 5% w/w and it was stored at 4^oC in desicator. The extract was suspended in distilled water using 1% acasia as suspending agent for oral administration to animals.

Experimental animals

Spargue dawley rats, weighing 150-200g, were procured from the Teena biolabs Pvt. Ltd. (Reg, no. 177/99 CPCSEA) Rangareddy, Andhra Pradesh. The animals were kept in polypropylene cages (6 in each cages) under standard laboratory condition (12 hr light and 12 hr dark day night cycle) and had free access to commercial pellet diet with water *ad libitum.* Animals were kept in animal house of St. John College of Pharmacy, Warangal. The animal house temperature was maintained at 25 ± 2^0C with relative humidity at (50 ±15%). The study was approved by the institutional animal ethical committee. Ethical norms were strictly followed during all experiments.

PHARMACOLOGICAL STUDIES

Induction of obesity in experimental rats

High Fat Diet Formula: casein-20%, D,L methionine-0.3%, corn starch -15%, sucrose - 27.5%, cellulose powder - 5%, mineral mixture-3.5%, vitamin mixture-1%, choline bitartrate-0.2%, corn oil -9.9%, lard oil-17.6% (Balamurugan and Muralidharan, 2010)

Preparation of diet

Obesity was induced by high fat diet administration in rats. High fat diet is a hyper caloric diet and was prepared by mixing the above said constituents in fixed percentage. The above mentioned percentage is for 100g diet. The feed was prepared, dried, powdered and administered every day in morning to animals with water *ad libitum.* Diet was administered and weight gain was observed in rats on third day, therefore confirming the development of obesity in rats. The study was continued for 40 days.

Experimental Design

The obtained Sprague dawley rats were randomly divided into 5 groups each group containing six animals. Group I was fed with normal diet and remaining groups fed with high fat diet for 40 days. The schedule of dose and diet administration in experimental groups was followed as:

Group I: The animals received normal diet served as control group

Group II: The animals received only high fat diet and served as diet control

Group III: The animals received high fat diet and treated with MESI (200mg/kg/p.o)

Group IV: The animals received high fat diet and treated with MESI (400mg/kg/ p.o)

Group V: The animals received high fat diet and treated with Standard drug

Sibutramine 5mg/kg/p.o)

***In vivo* Pharmacological evaluation**

The animals were observed for

- Body weight
- Food intake

Body Weight

The body weight (gm) was recorded on day one and then on alternate days for 40 days using digital weighing balance.

Food Intake

The daily food intake for group of 6 rats was measured daily for 40 days and expressed as mean daily food intake for group of 6 rats.

Biochemical Studies

Lipid profile

On day 41 animals blood samples were collected by retro orbital puncture the clear serum was separated at 2500 rpm for 10 min and was used for the estimation of Total cholesterol by using total cholesterol kit by CHOD-PAP method, HDL-cholesterol was estimated by PEG-CHOD-PAP method and Triglycerides was estimated by GPO-PAP method using standard kits. LDL-cholesterol, VLDL-cholesterol and the atherogenic index was calculated using standard equations (Mopuri Ramgopal *et al.,* 2010).

Statistical Analysis

The statistical Analysis was carried our using analyses of variance (ANOVA) followed by Dunnet's t test. p values <0.01, $p <0.05$ were considered as significant.

RESULTS

Effect on feed intake

Group II animals fed with HFD rats showed significant ($p<0.01$) increase in daily food intake when compared with group I animals. Treatment with MESI (200and400mg/kg/p.o) showed significant ($p<0.01$) decrease in daily food intake as compared with group II animals. Results are shown in (Table 1).

Effect on body weight

Group II animals fed on high fat diet (HFD) exhibited significant ($p<0.01$) increase in body weight between day 1 and day 40 as compared to group I animals Treatment with MESI (200 and 400mg/kg/p.o) showed a significant ($p<0.01$, $p<0.05$) decrease in body weight as compared with group II animals. The MESI extract at two dose levels resulted in dose dependent decrease body weight (Table 1).

Blood glucose

The blood glucose levels in group II animals were significantly ($p<0.01$) increased when compared with group I animals. Group III exhibited a significant ($p<0.05$) decreased and group IV exhibited significant decreased ($p<0.01$) when compared with group II animals (Table 1).

Total proteins

The total proteins levels of group II animals were increased significantly ($p<0.001$) as compared with group I animals. Group III animals exhibited no significant reduction but group IV animals exhibited a significant ($p<0.01$) decrease when compared with group II animals (Table 1).

LIPID PROFILE

Total cholesterol

Group II animals fed with HFD rats showed significant ($p<0.001$) increase in total cholesterol when compared with group I animals Group III to group IV animals exhibited a significant ($p<0.001$) decrease total cholesterol when compared with group II animals (Table 2).

HDL

Group II animals fed with HFD rats showed significant ($p<0.01$) reduction in HDL cholesterol when compared with Group I animals. The group III animals (MESI 200mg/kg/p.o) when compared with group II animals did not exhibit any significant changes but Group IV animals exihibited significant ($p<0.01$) increase HDL when compared to group II animals (Table 2).

Triglycerides

Group II animals showed significant ($p<0.001$) increase in triglycerides when compared with group I animals. Group III exhibited significant ($p<0.01$) decrease in triglyceride when compared group II animals. Group IV caused significant ($p<0.001$) decrease in triglycerides when compared with group II animals (Table 2).

LDL

Group II animals when compared with group I animals showed significant ($p<0.001$) increase in LDL levels. Group III and Group IV exhibited significant ($p<0.001$) decrease when compared with group II animals (Table 2).

VLDL

Group II animals when compared with group I animals exhibited significant ($p<0.001$) increase VLDL level. Group III and group IV when compared with group II animals exhibited significant ($p<0.01$) decrease in VLDL levels (Table 2).

Atherogenic Index and Percentage Protection

There was decrease in atherogenic index in treated groups. The percentage protection for group III (5.44), group IV (4.57) and group V (3.86) (Table 3).

Table 1. Effect of MESI on Different parameters

Groups	Treatment	Body Weight	Food intake	Glucose level	Protein level
I	Control	166.5±7.704	135.78±0.46	66.40±1.51	5.95±0.25
II	Diet control	$287.3\pm1.89^{a***}$	$152.76\pm2.70^{a**}$	$110.12\pm3.79^{a**}$	$12.15\pm0.21^{a***}$
III	MESI(200mg/kg)	$251.3\pm9.92^{b-ns}$	$140.56\pm0.35^{b**}$	$98.57\pm2.83^{b*}$	$10.11\pm0..^{99b-ns}$
IV	MESI(400mg/kg)	$217.4\pm16.60^{b**}$	$122.32\pm0.26^{b**}$	$89.79\pm3.23^{b**}$	$8.17\pm0.40^{b**}$
V	Standard	$181.4\pm13.81^{b***}$	$99.15\pm0.76^{b**}$	$84.05\pm1.37^{b**}$	$6.14\pm0.62^{b***}$

Values are mean ± SEM of six (n=6) observations; Comparison between: a- Group I and Group II, b- Group II Vs Group III, Group IV; Statistical significant test for comparison was done by ANOVA, followed by Dunnet's 't' test; *p<0.05; ** p<0.01; ***p<0.001; ns-non significant.

Table 2. Effect of MESI on Lipid profile

Groups	Treatment	Cholesterol	TG	LDL-C	VLDL-C	HDL-C
I	Control	81.99±4.22	163.54±2.74	23.24±0.66	32.45±0.43	45.54±1.67
II	Diet control	$153.03\pm2.04^{a***}$	$261.68\pm8.78^{a***}$	$45.42\pm1.65^{a***}$	$52.22\pm1.47^{a**}$	$34.67\pm2.29^{a**}$
III	MESI(200mg/kg)	$126.33\pm3.82^{b***}$	$222.43\pm9.64^{b**}$	$36.56\pm1.98^{b***}$	$44.66\pm2.06^{b***}$	$37.21\pm2.36^{b-ns}$
IV	MESI(400mg/kg)	$114.95\pm6.65^{b***}$	$196.57\pm6.08^{b***}$	$29.76\pm0.70^{b***}$	$39.22\pm1.21^{b***}$	$43.11\pm2.15^{b*}$
V	Standard	$100.58\pm3.74^{b***}$	$177.14\pm4.69^{b***}$	$24.78\pm0.97^{b***}$	$35.52\pm0.93^{b***}$	$46.55\pm2.58^{b**}$

Values are mean ± SEM of six (n=6) observations; Comparison between: a- Group I and Group II, b- Group II Vs Group III, Group IV. Statistical significant test for comparison was done by ANOVA, followed by Dunnet's 't' test; *p<0.05; ** p<0.01; ***p<0.001; ns-non significant.

Table 3. Atherogenic index and % protection of different group of rats

Groups	Treatment	Atherogenic index	% protection
Group I	Control	3.47	-
Group II	Diet control	7.72	-
Group III	200mg/kg	5.44	29.53
Group IV	400mg/kg	4.57	40.80
Group V	Standard	3.86	50.83

DISCUSSION AND CONCLUSION

Dietary obesity can be induced readily in laboratory rodents by giving high fat diets or cafeteria diets. Obesity also occurs in rodents given a palatable sugar solution in additional to laboratory chow. These animals consume only about half of as much chow as animals not given sugar, additional calories from sugar solution generally results in greater total dietary energy intake and development of profound obesity (Chen and Linn 2000).Treatment with MESI resulted in reduction of body weight in HFD fed rats indicating that the extracts possess weight reducing property. Since obesity is associated with hyperphagia, HFD fed rats consumed more food than normal diet fed rats. MESI were effective in decreasing daily food intake in HFD fed rats, indicating that it possess hypophagic property.

The MESI at two dose levels showed significant reduction in serum levels of total cholesterol, LDL cholesterol, VLDL cholesterol and triglycerides along with significant increase in serum HDL cholesterol levels in HFD fed rats. Methanolic extract (400 mg/kg/p/o) has showed to possess more hypolipidemic and hypocholesterolemic activity.

The evaluation was carried out with the methanolic extract of *Sesamum indicum* on obesity and performed it could be predicted that significant anti obese activity due to its hypoglycaemic and hypolipdemic effect in rats fed on high fat diet the long history of use of *Sesamum indicum* may have therapeutic and protective applications in the treatment.

REFERENCES

Balamurugan G, Muralidharan P. Anti obesity effect of *Bauhinia variegata bark*. *Bangladesh Journal of Pharmacology*, 5, 2010, 8-12.

Chakraborthy GS, Sharma G, Kaushik KN. *Sesamum indicum* review *Journal of Herbal Medicinal and Toxicology*, 2(2), 2008, 15-19.

Chen MD, Linn PY. Zinc induced hyperleptinemia relates to the amelioration of sucrose induced obesity with zinc repletion *Obesity Research*, 8(7), 2000, 525-529.

Hartz AJ, Rupley DC, Kalhhof RD and Rim AA. Relationship of obesity to diabetes: influence of obesity level and body fat distribution .*Prev.Med.*, 12, 1983, 351-357.

Kiran K, Mohammed Asad. Wound healing activity of *Sesamum indicum* linn seed and oil in rats. *Indian Journal Experimental Biology*, 46, 2008, 777-782.

Larson BP Bjorntorp G Tibblin. The health consequences of moderate obesity. *Int.J Obes*, 5, 1981, 97-116.

Mopuri Ramgopal, Idress H. Attitalla, Avinash P and Meriga Balagi. Evaluation of antilipidemic and anti obesity efficacy of *Bahunia purpurea* bark extract on rats fed with high fat diet. *Academic Journal of Plant Sciences*, 3 (3), 2010, 104-107.

Nahar I, Rokonuzzaman. Investigation of the Analgesic and Antioxidant activity from an ethanol extract of seeds of *Sesamum indicum* .*Pakisthan Journal of Biological Sciences*, 12(7), 2009, 595-598.

Rehane Syad, Peter Karlvosky. Antifungal Properties of *Sesamum indicum* L. Crude Extract and Purified Sesame Lignans, World Food System a contribution from Europe. *Tropentag*, 2010, 14-16.

Sharpe PA, Blanck JE, Willams BE, Ainsoworth and Conway JM. Use of complementary and alternative medicine for weight control in the united states. *J.Altern Complement Med*, 13, 2007, 217-222.