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Research Article

EFFECT OF ETHANOLIC EXTRACT OF *HIBISCUS CANNABINUS* LEAF ON HIGH CHOLESTEROL DIET INDUCED OBESITY IN FEMALE ALBINO RATS

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ABSTRACT

Objective: Even with the growing awareness, about 3% of Indian population are obese and worldwide around 1.2 billion people suffer with obesity and those suffer with the related complications might be much higher. Preventing the occurrence of obesity by including certain food substances with antiobesity effect in our regular diet would always be a welcome move. In this context, the ethanolic extracts of *Hibiscus cannabinus* leaves were examined by *in vivo* study on high cholesterol diet induced obese female albino rats, since female obesity is prevalent among Indian women. *Hibiscus cannabinus* is a plant of Malvaceae family, native to southern Asia.
Methods: Female wistar rats were divided into five groups. Clinical condition was induced by giving high cholesterol diet and treated with the ethanolic extract of *Hibiscus cannabinus* leaf. a very common green used in Indian diet.
Results: In cholesterol diet induced animals treated with the extracts of *H. cannabinus* and lovastatin demonstrated a significant decrease in the serum cholesterol, triglycerides, LDL-C and also significant decrease in the levels of SGOT and SGPT activities when compared to cholesterol diet induced group. The groups treated with the extracts of *H .cannabinus* also showed decrease in body weights when compared to cholesterol induced group. The histopathological studies of liver sections of rats showed reversal of changes, and prevent the fat accumulation in the liver of hyperlipidemic group after treatment with *H. cannabinus*. Conclusion: Results suggested that the ethanolic extracts of *H. cannabinus* possess significant antiobesity effect which might me attributed by its rich phytochemical presence.

Keywords: Hibiscus cannabinus, Antiobesity, Lovastatin.

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. Body mass index (BMI), a measurement which compares weight and height, defines people as overweight (pre-obese) if their BMI is between 25 and 30 kg/m2, and obese when it is greater than 30 kg/m2. Obesity is one of the leading preventable causes of death worldwide. Obesity increases the likelihood of various diseases, particularly heart disease, type 2 diabetes, obstructive sleep apnea, certain types of cancer, and osteoarthritis. Leptin and ghrelin are considered to be complementary in their influence on appetite, with ghrelin produced by the stomach modulating short-term appetitive control (i.e. to eat when the stomach is empty and to stop when the stomach is stretched). Leptin is produced by adipose tissue to signal fat storage reserves in the body, and mediates long-term appetitive controls (i.e. to eat more when fat storages are low and less when fat storages are high). Although administration of leptin may be effective in a small subset of obese individuals who are leptin deficient, most obese individuals are thought to be leptin resistant and have been found to have high levels of leptin [1].

Hibiscus cannabinus (HC), a Malvaceae, is a tall annual woody tropical plant commonly known as kenaf. In Cameroon and some other parts of the world, the leaves are eaten as vegetable. It is a very popular green leafy vegetable in the states of Andhra Pradesh and Tamil Nadu of India, locally known as "*Pulichai keerai*" in tamil and "*Gongura*" in telugu. They are chopped, washed and added to cooking beans and peas to improve the consistency of the dish. The dried seeds are roasted and crushed to a powder and used to prepare a beverage in a similar way as coffee [2]. In the African folk medicine *Hibiscus cannabinus* is a panacea in anaemic therapy. Earlier studies have reported the haematinic and hepatoprotective activities of this plant [3]. *Hibiscus cannabinus* possess a number of phytochemicals in high quantity and exhibit high antioxidant activities [4]. It also contains alkaloid, tannin, flavonoids, ascorbic acid, saponin, anthocyanin, polyphenols, oxalate and phytate in detectable amounts [5]. The objective of this study was to investigate the anti obesity activity of the ethanolic extract of *H. cannabinus* leaves on high cholesterol diet induced obese rats.

MATERIALS AND METHOD

Plant material

Hibiscus cannabinus, (whole plant) was purchased from the local vegetable market in Trichy. The plant was authenticated at the Raphinat Herbarium, St. Joseph's College, Trichy. The plants were washed, shade dried and ground into a coarse powder.

Extraction

Ground plant material (50 g) was soaked in ethanol for 12 hrs, subjected to soxhlet extraction at 85 ^{0}C using ethanol as solvent. The solvent was filtered and filtrate was allowed to evaporate for one day to obtain dried extract *(H. cannabinus*)

Experimental Animals

Female Wistar albino rats (130-150 g) were obtained from a registered breeder in Bangalore. The animals were housed at a room temperature; animals were provided with standard commercially available rat diet and water *ad libitum*. The study was carried out in accordance to the regulations of Institutional Animal Ethical committee of St. Joseph's College, Trichy.

High fat diet group

The rats were fed with high fat diet for 30 days to induce obesity except normal control group rats which received normal diet. The composition of high fat diet was cholesterol (1%), Cholic acid (0.4%), Coconut oil (50ml/kg of feed). Improvements in the weight of the animals were monitored on alternate days. After the period animals found to be obese were taken for study.

Experimental design

The rats were divided into five groups; each group containing six animals. Group I (Normal control**)** rat received normal diet and water. Group II was the hyperlipidemic group in which the obese

rats were selected from high cholesterol diet fed animals and treated with *H. cannabinus* extract (200mg / kg) for 20 days. Group III animals were treated with *H. cannabinus* extract (200mg/kg) along with normal diet. Group IV animals were selected from the high cholesterol diet fed group and treated with extract *H. cannabinus* (200mg/kg) for 20 days as in group II. Group V, positive control group in which rats were administered with Lovastatin (20 mg /kg) to the obese animals for 20 days.

The extract of *H. cannabinus* was given orally with DMSO, the vehicle, daily for 20 days and anti obesity drug lovostatin also given by oral route. At the end of the experimental period the rats were fasted overnight and sacrificed by cervical decapitation. Blood sample were collected in separate containers and the biochemical parameters were analysed. The liver and hear tissue was dissected out aseptically and used for histological evaluation. The parameters of study were blood cholesterol, TGL, LDL, HDL, SGOT and SGPT [6]. Statistical analysis was carried out and the results were expressed as mean ± SD .The significance of the difference the means of the tests and control studies was established by applying student 't' test for independent samples.

RESULTS AND DISCUSSION

Obesity increases the likelihood of various diseases, particularly heart disease, type 2 diabetes, obstructive sleep apnea, certain types of cancer, and osteoarthritis. Obesity is most commonly caused by a combination of excessive food energy intake, lack of physical activity, and genetic susceptibility, although a few cases are caused primarily by genes, endocrine disorders, medications or psychiatric illness. Obesity is a leading preventable cause of death worldwide, with increasing prevalence in adults and children, and authorities view it as one of the most serious public health problems of the 21st century [7].

Anti-obesity medication or weight loss drugs are all pharmacological agents that reduce or control weight. These drugs alter one of the fundamental processes of the human body, weight regulation, by altering appetite, metabolism, or absorption of calories. The main treatment modalities for overweight and obese individuals remain dieting and physical exercise [8]. Some anti-obesity drugs have severe or life-threatening side effects, fen-phen being a famous example. These side effects are often associated with their mechanism of action [9]. In general, stimulants carry a risk of high blood pressure, faster heart rate, palpitations, closed-angle glaucoma, drug addiction, restlessness, agitation, and insomnia. Another drug, orlistat, blocks absorption of dietary fats, and as a result may cause oily spotting bowel movements (steatorrhea), oily stools, stomach pain, and flatulence. A similar medication, designed for patients with Type 2 diabetes, is Acarbose which partially blocks absorption of carbohydrates in the small intestine, and produces similar side effects including stomach pain, and flatulence [10].

In cholesterol diet induced groups treated with the extracts of *H. cannabinus* and lovastatin demonstrated a significant decrease in the serum cholesterol, triglycerides, LDL-C, and also significant decrease in the levels of SGOT and SGPT activities when compared to cholesterol induced group. The groups treated with the extracts of *H. cannabinus* also showed decrease in body weights when compared to cholesterol induced group [11]. The histopathological studies in liver and heart sections of rats showed the changes, and prevent the fat accumulation in the liver of hyperlipidemic group. The ethanolic extracts of *H. cannabinus* showed a significant anti obesity effect in the animal studies whereas, treatment with HC extract failed to show a effect on serum HDL-C level.

In the present study, the effect of oral administration of ethanolic extract of *H.cannabinus L.* on experimentally cholesterol diet induced female albino rats, at dose of 200mg/Kg which was almost comparable to that of the standard lovastatin drug used in treatment. The observed activity of antiobesity may be due to the presence of phenolic compounds like flavonoids, anthocyanins,Vitamin C and alkaloids in HC extract [12]. It is edible plant, and it has been reported that administration of HC extract showed antioxidant and ant diabetic activity.

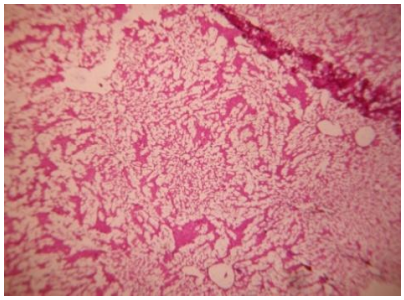
CONCLUSION

To overcome the adversity produced by the antiobesity drugs medicinal plant therapy is followed. In this study, it has been proved that the *Hibiscus cannabinus* leaves extract is capable of reducing the body cholesterol and histopathological study showed groups treated with extract of HC considerably reduced the fat accumulation in the liver tissue of the rats of experimental group and lovastatin group showed mild fatty infiltration, moreover HC leaf possesses the edible value and contains high phenolic compounds. Hence, the plant extract has minimized the possible side effects of the antiobesity drug and notably reduced the symptoms of obesity in the animals of treatment group.

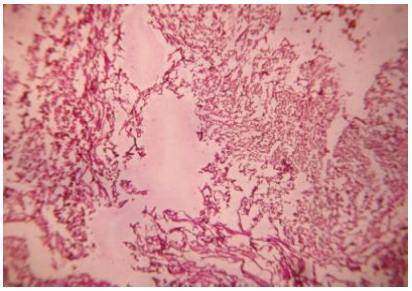
Table 1- Effect of *H .cannabinus* extracts on serum lipid profile and enzyme activity in normal and obese rats

Groups	Body weight	Cholesterol (mg/dl)	TG (mg/dl)	SGOT	SGPT	LDL	HDL
Group I	144 ±2.7	66.5 ± 6.4	64.75±5.4	19.5±2.4	20.2±2.2	25.2±12	25.2±12
Group II	183 ± 3.4	80.5 ± 4.7	95.32±4.5	43.3±3.9	45.7±6.3	35.2±9.2	19±5.0
Group III	169 ± 1.5*	64.5 ± 7.9*	67.34±6.7*	20.5±4.3*	22.5±3.3*	26±13.4*	28.8±6.5*
Group IV	154 ± 1.7*	43.1 ± 3.0	71.68±8.8*	35.2±6.7*	33.5±2.2*	30.5±15.5*	37.6±11.*
Group V	161 ± 3.4*	60 ± 4.2*	75.01±1.6*	21.7±1.7*	36.75±5*	24±17.0*	22.8±9.4*

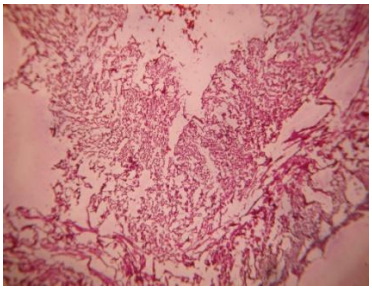
Values are expressed as mean ±SE of animals, *- P values < 0.05.



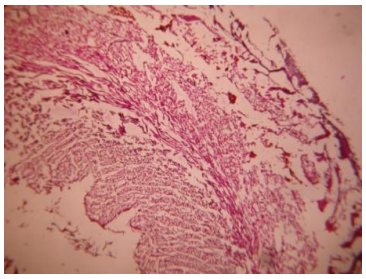
a.Normal group



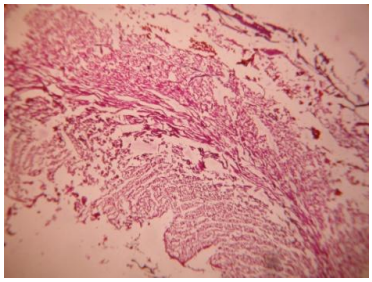
b. Hyperlipidemic group



c. H.C extract group



d. Obesity+ HC extract group



e. Obesity + lovastatin group

Fig.1: It shows the histopathology of liver section of rats a) control group showing normal architecture, b) hyperlipidemic group showing fatty infiltration, c) H. cannabinus extract treated groups showing very low much fatty infiltration, d) groups treated with H. cannabinus extract showing mild fatty infiltration, e) groups treated with lovastatin showing mild fatty infiltration.

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