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ANTI HYPERLIPIDEMIC ACTIVITY OF *Saccharum Officinarum* Linn FRESH JUICE IN PARACETAMOL INDUCED HYPERLIPIDEMIC RATS

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ABSTRACT

Aim & Objective: Evaluation Of Anti-hyperlipidemic Activity of *Saccharum Officinarum L* Plant fresh juice.

Material and Methods: This was a laboratory based experimental study. A total of 24 Wistar Albino rats were divided into four groups as the control group (1.5 mL distilled water), the PCM group (3000 mg/kg PCM), Clofibrate + PCM group (50mg/kg + 3000 mg/kg PCM), the *S. Officinarum* L. juice + PCM group (1.5 mL *S. Officinarum* L. juice + 3000 mg/kg PCM) and *Saccharum Officinarum* L. juice and distilled water were administered for eight days. Paracetamol was administered on day 8th. The level of thiobarbituric acid reactive substances, as an oxidative marker, was measured in the blood and liver tissue on day 9th. In addition, liver tissues were evaluated histological (in terms of increased vein inlet, connective tissue, granular degeneration, mononuclear cell infiltration, necrotic cells and vascular congestion).

Results: In hyperlipidemic control group paracetamol 3000mg/kg resulted in a significant increase in TG, TC, LDL, VLDL, atherogenic index and a significant decrease was found for HDL values compared with normal control. The treatment group of Clofibrate (50 mg/kg) and *Saccharum Officinarum L* juice (1.5ml, p.o.) showed significant decrease in TG, TC, LDL, VLDL, atherogenic index and serum glucose compared with hyperlipidemic control.

Conlusion: The study revealed that Clofibrate, *Saccharum Officinarum L* juice (1.5ml, p.o.)

possesses significant Antihyperlipidemic activity. Among all treated group dose of *Saccharum Officinarum L* juice found to be more effective against paracetamol 3gm induced hyperlipidemia.

Keywords: Antihyperlipidemic effect, *Saccharum Officinarum* L, Hyperlipidemia, Paracetamol, Albino rats

INTRODUCTION

Hyperlipidemia is a major cause of atherosclerosis and the atherosclerosis-associated conditions, such as coronary heart disease, ischemic cerebrovascular disease and peripheral vascular disease. Although the incidence of the atherosclerosis related events has declined in the united states, these condition still accounts for the majority of morbidity and mortality among middle aged and older adults, the incidence and absolute number of annual events will increase over the next decade because of epidemic of obesity and ageing of the U.S population **[1, 2]**.

Hyperlipidemia is characterized by alteration occurring in serum lipid and lipoprotein profile due to increased concentration of Total cholesterol (TC), Low density lipoprotein cholesterol (LDL- C), Very low density lipoprotein cholesterol (VLDL-C) and Triglyceride (TG) with concomitants decrease in concentration of High density lipoprotein cholesterol (HDL-C) in blood circulation **[3]**. Disorders of lipid metabolism, following oxidative stress are the prime risk factors for initiation and progression of these diseases **[4]**.

Many researchers have documented that the action of herbal drug has shown promising effect. Medicinal plants play a major role in hyperlipidemic activity, literature suggests that the lipid lowering action is mediated through, inhibition of hepatic cholesterol biosynthesis and reduction of lipid absorption in the intestine **[5]**.

It consists of plant *Saccharum officinarum* L. belonging to family Poaceae. *Saccharum officinarum* is a persistent plant with juicy, thick, and stout stem; Clumps are pale. Leaves are broad and panicle. Spikelets are large, linear and oblong surrounded by hairs **[6]**. Rhizomes are formed under the soil; send up derived shoots near the parent plant **[7-8]**.

Cultivation: *S. officinarum* is widely cultivated in India mostly in Uttar Pradesh, Maharashtra, Punjab, Gujarat, Andhra Pradesh, Telangana, Karnataka etc. Sugar cane is also found in the tropics and south-east Asia **[9]**.

Medicinal Uses

The stem of *S. officinarum* has laxative, diuretics, and cooling effect **[10]**. The pulp is used for covering wounds. Sugar cane is used by Borneo for the treatment of fractures. Sugar cane extract is used by Chinese traditional medicine for promoting expulsion of phlegm from respiratory passages and stimulating gastric activity. It is also used against various skin diseases such as, abscess, ulcers, and wounds, and for other infectious diseases such as, chest pain, eye inflammations, and sore throat. Juice of the stem is used in Ayurvedic Pharmacopoeia of India for hemorrhagic diseases and anuria and root is also used in dysuria. It is also used in folk medicine as a remedy for arthritis, bedsore, boils, cold, cough, diarrhea, dysentery, fever, hiccups, sores, spleen, tumors and wounds **[11]**.

As it is one of the herbs which possess large number of therapeutic efficacies, it was felt worthwhile to evaluate its role during hyperlipidaemia condition either alone or in presence of conventional Antihyperlipidemic drug.

The present work was, therefore, designed to evaluate the effect of *Saccharum officinarum* L. on paracetamol induced hyperlipidemia.

MATERIAL AND METHODS

Collection and Authentication of plant: The plant of *S.officinarum* was selected after the literature survey and collected from Gajraula, Amroha (U.P). The plant of *S. officinarum* was authenticated by the senior botanist **Dr D.C Kasana**; head of the department of Botany, I.P College of Science, Bulandshahr (U.P). Specification – IP College of Science - SOP- BVSO/09/1753

Procurement of Diagnostic Kit:

Total cholesterol estimation was done by using the span total cholesterol diagnostic kit. Serum triglycerides and HDL were estimated by span triglycerides diagnostic kit. Cholesterol, triglycerides and HDL profile

Preparation of Juice:

Sugarcane of *Saccharum officinarum* L was milled between two rollers and juice thus obtained was strainer on it. Squeeze the juice out of the extract pressing through cloth or strainer.

Experimental Animals

Healthy adult Albino rats were selected for the study. They were fed with standard pellet diet and water ad libitum. All animal protocols were approved by Institutional Animal Ethical committee (IAEC) of the organization (Reg. The Institutional Animal Ethical Committee of Janta College of Pharmacy Butana, (Sonepat) Haryana, India

(667/02/c/CPCSEA) approved the studies.). All animals were maintained under standard conditions of humidity (50±10%), temperature (22±20^{0}c) & light (12 hours light & 12 hours dark).

Paracetamol induced Hyperlipidemia:-

Experimental animals: 24 male (n=6) Wistar-Albino rats which were just weaned with a weight of 150-200 gm (4-5 weeks of age) were used in the study **[12]**.

S. No	Groups	Treatments
1.	Positive Control	1.5 mL/day distilled water was given orally for eight days.
2.	Negative Control	1.5 mL/day distilled water was given by gavage for eight days, paracetamol was given orally at a dose of 3000 mg/kg on the 8th day
3.	Standard (Clofibrate)	Drug control animal: Paracetamol induced hepatotoxicity animals treated with Clofibrate (50mg/kg-bw) for 8th days.
4.	*S.officinarum* L (Fresh Juice)	*S. officinarum* L+ Paracetamol: 1.5 mL/day sugarcane juice was given by gavage for eight day; paracetamol was given orally at a dose of 3000 mg/kg on the 8th day.

Anesthesia, obtaining tissue and blood samples: On the 9th day, anesthesia was achieved by i.p (intraperitoneal) route ket-amine (80 mg/kg) and xylazine (10 mg/kg) before sacrifice and collect the blood sample (3-6 mL) was obtained from the aorta with sterile injector. The blood samples were cen-trifuged at 5000 RPM for 5 minutes and their sera were separated. At the end of the study, the abdomen was cut in the midline and the right lobe of the liver was removed for histological examination **[13]**.

Histopathological examination: The tissues were fixed in 10% neutral formaldehyde solution and paraffin blocks were prepared. Five-micron-thick sections were obtained from the paraffin blocks prepared. The samples were stained with hematoxylin-eosine for histological evaluation **[14]**.

Estimation of blood cholesterol and lipid profile:

Total cholesterol estimation was done by using the span total cholesterol diagnostic kit. Serum triglycerides and HDL were estimated by span triglycerides diagnostic kit. Cholesterol, triglycerides and HDL profile were estimated using standard monograph

LDL cholesterol was calculated using formula

LDL = Total Cholesterol - HDL - Triglycerides/5

VLDL was calculated using the formula

VLDL = Triglycerides/5

STATISTICAL ANALYSIS

The data of results obtained were subjected to statistical analysis and expressed as mean ± SD. the data were statically analyzed by one way analysis of various (ANOVA) and compare the means of the studied groups with standard. The data were statically

analyzed by Graph pad prism Software version (7.1).

RESULT

Preliminary Phytochemical Investigation of fresh juice of *S. officinarum* [15]

The phytochemical screening of fresh juice of *S. officinarum* stem exhibited that the main components i.e. Tannins, phenolic compounds, carbohydrate, Saponins, glycosides, flavonoids, alkaloids and fats.

Effect of *Saccharum Officinarum L.* Juice on total cholesterol & lipid profile (Table 1)

Paracetamol administration caused acute hyperlipidemia in rats where it significantly increased total cholesterol, TG and decreased in HDL in rats treated with paracetamol groups as compared to normal control group ($p<0.001$).

Histopathology of paracetamol induced hyperlipidemia method model (Hem toxin & Eosinx100)

Results are shown in **Figure 2 A-D.**

Table 1: Effect of Juice of *Saccharum Officinarum* L on serum lipid profile paracetamol induced hyperlipidemia

Groups	TC (mg/dl)	TG (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	VLDL (mg/dl)
Positive Control	76.45±3.39*	71.60±1.34*	30.43±3.27*	26.21±2.43*	12.40±1.34*
Hyperlippidimic Control	173.05±2.8	169.91±7.01	29.47±2.81	109.33±5.48	28.78±1.40
Clofibrate Control	88.63±3.29***	80.48±4.30**	38.10±2.40***	45.42±4.82**	15.90±0.86**
S.officinarum L. Juice	133.98±3.76***	149.94±3.20*	31.70±2.78**	75.76±5.12***	22.22±0.78*

Values are expressed as MEAN ± SEM (n=6) one way ANOVA test. *p<0.05: significant when compared to disease control group; **p<0.01: significant when compared to disease control group; ***p<0.001: highly significant when compared to disease control group

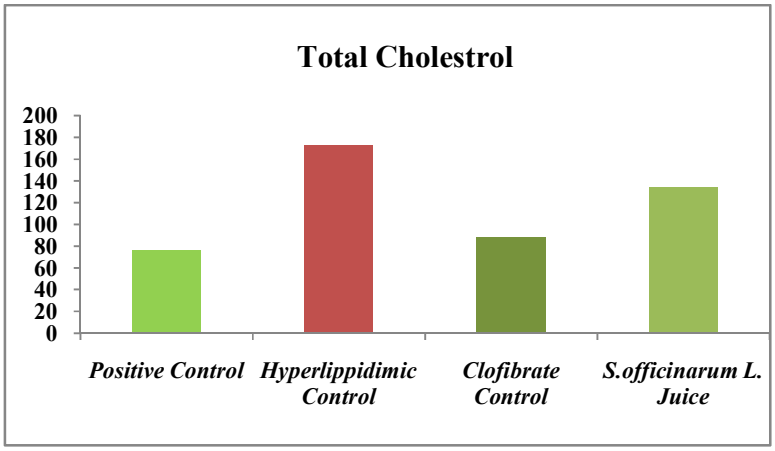

Figure 1 (a): Representing the effect of fresh juice of *S. officinarum* on TC levels in PCM- induced hyperlipidemia in rats

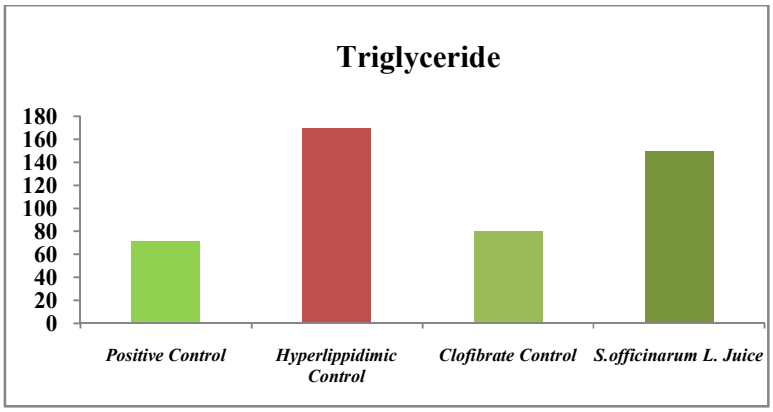

Figure 1 (b): Representing the effect of fresh juice of *S. officinarum* on TG levels in PCM- induced hyperlipidemia in rats

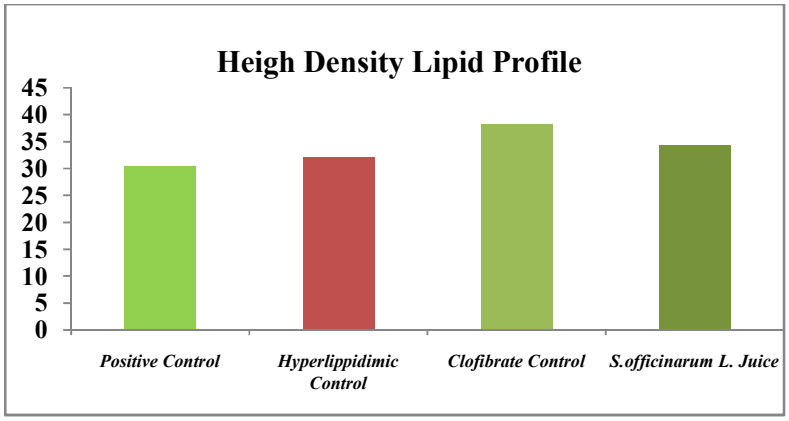

Figure 1 (c): Representing the effect of fresh juice of *S. officinarum* on HDL levels in PCM- induced hyperlipidemia in rats

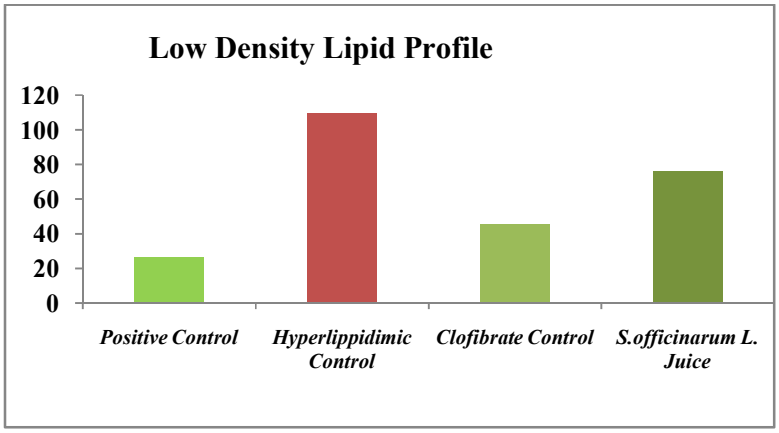

Figure 1 (d): Representing the effect of fresh juice of *S. officinarum* on LDL levels in PCM- induced hyperlipidemia in rats

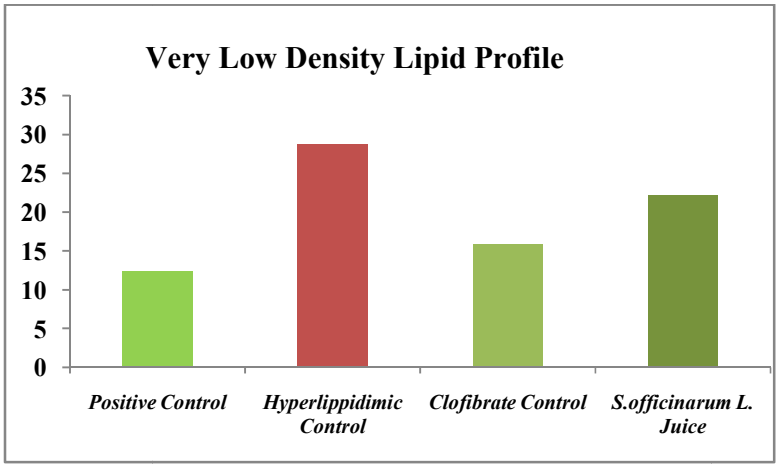

Figure 1 (e): Representing the effect of fresh juice of *S. officinarum* on VLDL levels in PCM- induced hyperlipidemia in rats

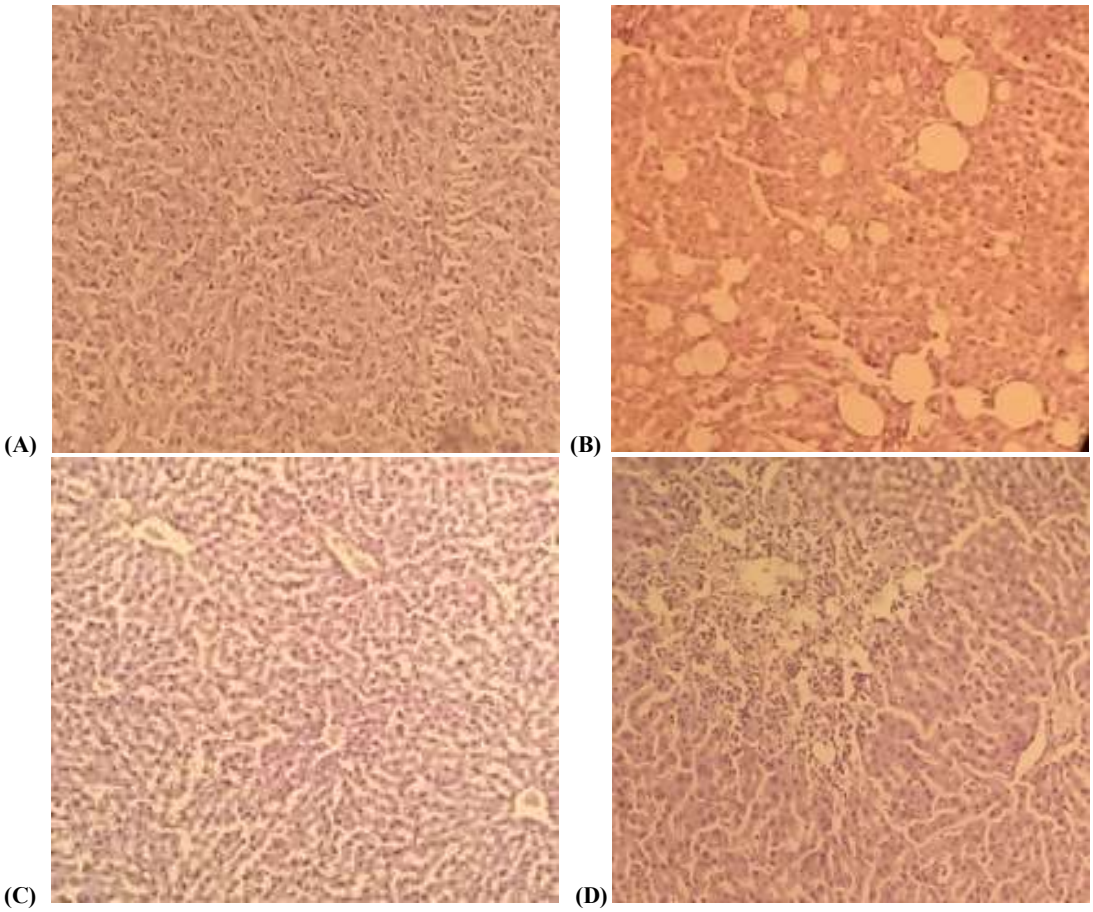

Figure 2: Effect of *Saccharum Officinarum* L juice by different levels on histopathological examination of liver of paracetamol-induced hyperlipidemia in rats

(A) Microscopic examination of liver of rat in the normal control group, showing the normal histological structure

(B) Microscopic examination of liver of paracetamol-induced control showing marked hepatocyte hydropic degeneration and portal tract with chronic inflammatory cells

(C) Microscopic examination of liver of animal treated with standard drug (Clofibrate) showing central vein with mild to moderate diffuse granular degeneration and very mild necrosis in hepatocytes

(D) Microscopic examination of liver of animal treated with *Saccharum Officinarum* L juice showing hepatocellular vacuolization with mild histological structure regeneration of hepatocytes and reduced necrosis

DISCUSSION

The aim of the present study was to elucidate the role of *Saccharum Officinarum* L juice during hyperlipidemia induced by paracetamol in rat. Paracetamol was used to induce acute hyperlipidemia. It is well known that paracetamol (a non-ionic detergent) elevates total TC and TG in blood by altering the hepatic lipid metabolism. This model has been used as a screening method for hyperlipidemic agents and also for elucidating lipid metabolism.

Moreover, this could be associated with a down regulation in LDL receptors by the cholesterol and saturated fatty acids in the diet, which could also explain the elevation of serum LDL-C levels either by changing hepatic LDL-R (LDL-receptor) activity, the LDL production rate or both.

The activity of cholesteryl ester transfer protein (CETP), a key enzyme in reverse cholesterol transport and HDL metabolism increase in high fat diet and mediates the transfer of cholesteryl esters from HDL-C to triglyceride-rich particles in exchange for triglycerides. This leads to increased plasma concentrations of TGs and decreased concentrations of HDL-C.

Lipid profile of hyperlipidemic control rats in our study revealed higher levels of serum triglycerides, cholesterol, LDL and VLDL accompanied by decrease of serum HDL-C as compared to controls.

Treatment hyperlipidemic rats with Clofibrate, dose of *Saccharum Officinarum* L juice (1.5ml) showed a significant decrease of serum triglycerides, cholesterol, LDL and VLDL and significant increase of serum HDL-C levels compare to hyperlipidemia control.

The potential of protective effect may be due to the rich source of Polyphenols present as a chief chemical constituent but the exact mechanism is still not clear.

CONLUSION

The study revealed that Clofibrate, *Saccharum Officinarum* L juice (1.5ml, p.o.) possesses significant Anti-hyperlipidemic activity. Among all treated group dose of *Saccharum Officinarum* L juice found to be more effective against paracetamol 3gm induced hyperlipidemia.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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