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Evaluation of hypolipidemic activity of ethanolic extract from whole plant of *Saccharum spontaneum* Linn. in rat fed with atherogenic diet

J. Amutha Iswarya Devi* and A. Kottai Muthu

Department of Pharmacy, Annamalai University, Annamalai Nagar, India

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ABSTRACT

The present study was designed to investigate the hypolipidemic effect of ethanolic extract from whole plant of Saccharum spontaneum (Linn.) (Family: Graminae) in rats fed with atherogenic diet. The acute toxicity study was showed that the ethanolic extract are safe up to 2000mg/kg, thus one tenth of this dose was consider as evaluation dose. Ethanolic extract of Saccharum spontaneum was administered in doses of 200 and 400mg/kg/day to rats fed with atherogenic diet to assess its possible lipid-lowering potential. There was a recognize raise in the body weight in AD fed group ($p<0.001$), which was reduced by the administration of ethanolic extract of Saccharum spontaneum (400mg/kg). The elevated levels of total cholesterol, triglycerides, phospholipids, LDL-C and VLDL-C and decrease the plasma HDL-C were observed in rats fed with atherogenic diet (group II). After treatment of ethanolic extract of Saccharum spontaneum (400mg/kg/day) showed a significant ($p<0.001$) decrement in body weight, plasma and tissue total cholesterol, triglycerides, phospholipids, plasma LDL-C and VLDL-C all along with an raise in plasma HDL-C when compared to AD rats (group II). The ethanolic extract of Saccharum spontaneum could protect against atherosclerosis and decrease the atherogenic index. This finding provides some biochemical basis for the use of ethanolic extract of whole plant of Saccharum spontaneum as hypolipidemic agent having preventive and curative effect against hyperlipidemia.

Key words: Atherogenic diet; Hypolipidemia; Rats; *Saccharum spontaneum.*

INTRODUCTION

Coronary Artery Disease (CAD) has been accounted for as the most widely recognized reason for death in grew and in addition creating nations [1-3]. Hyperlipidemia is portrayed by increased serum total cholesterol, low-density (LDL) and very low density lipoprotein cholesterol (VLDL) with diminished high-density lipoprotein (HDL) levels. Hyperlipidemia-related lipid issue are considered to bring about atherosclerotic cardiovascular disease [4].

Saccharum spontaneum (Linn.) ; Synonyms, Ahlek, loa, wild cane, wild sugarcane, Family: Poaceae. In India, it is considered as valuable aromatic plant in traditional systems of medicine. It is popular folk medication. The whole plant used to treat diseases such as vomiting, mental diseases, abdominal disorders, dyspnoea, anaemia, and obesity. The rural public use the fresh juice of the stem of *Saccharum spontaneum* plant for the treatment of mental illness and mental disturbances. The stems are also useful for renal and vesicol calculi dyspepsia, haemorrhoids, menorrhagia dysentery, agalactia phthisis and general debility. The roots are sweet, astringent, emollient, refrigerant, diuretic, lithontriptic, purgative, tonic, aphrodisiac and useful in the treatment of dyspepsia, burning sensation, piles, sexual weakness, gynaecological troubles, respiratory troubles etc[5]. Leaves are employed for cathartic and diuretics[6]. However, the plant is reported to possess the activities like anti-diarrhoeal [7], CNS depressant[8] and antiurolithiatic activity[9]. Literature survey revealed that there is a no earlier scientific reports regarding hypolipidemic activity of this plant. Therefore, objective of the present investigation was to study the hypolipidemic effect of ethanolic extract of whole plant of *Saccharum spontaneum* (Linn.) on hyperlipidemia elicited by atherogenic diet in rats.

MATERIALS AND METHODS

Plant materials

The whole plant of *Saccharum spontaneum* (Linn.) were collected from Cheranmahadevi, Tirunelveli District of Tamil Nadu, India. Taxonomic distinguishing proof was produced using Botanical Survey of Medicinal Plants Unit Siddha, Government of India. Palayamkottai. The whole plant of *Saccharum spontaneum* (Linn.) were dried under shade, segregated, pulverized by a mechanical processor and introduced into a 40 mesh sieve. The ethanolic extract was stored in screw cap vial at 4ºC until further use.

Preparation of extract

The above powdered materials were successively extracted with ethanol (40-60ºC) by continuous hot percolation method in Soxhlet apparatus for 24 hours. Then the extract was concentrated by using a rotary evaporator and subjected to freeze drying in a lyophilizer till dry powder was obtained.

Animals

Thirty adult male wistar rats, measuring approximately 150-180g were gotten from Central Animal House, Rajah Muthiah Medical College, Annamalai University. The animals were kept in cages, 2 per cage, with relative humidity (55%) in a 12 hour light/dark cycle at 25º±2ºC. They were offered access to water and a commercial diet *ad libitum*. The experiment were completed according to the guidelines of Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), New Delhi, India, and sanction by the Institutional Animal Ethics Committee (IAEC), Annamalai University (Approved number: 160/1999/CPCSEA/1083).

Animal diet

The compositions of the two diets were used as follows[10]:

Control diet: Wheat flour 22.5%, roasted bengal gram powder 60%, skimmed milk powder 5%, casein 4%, refined oil 4%, salt blend with starch 4% and vitamin & choline blend 0.5%.

Atherogenic diet: Wheat flour 20.5%, roasted bengal gram 52.6%, skimmed milk powder 5%, casein 4%, refined oil 4%, coconut oil 9%, salt blend with starch 4% and vitamin & choline blend 0.5%, cholesterol 0.4%.

Acute toxicity studies

Oral acute toxicity studies were carried out with male wistar rats weighing 150-180g as per (OECD) draft guidelines rules 423 adopted on seventeenth December 2001 got from Committee for the purpose of Control and Supervision of Experimental Animals (CPCSEA). The rats were fed with ethanolic extract of *Saccharum spontaneum* suspended in 1% gum acacia at the dose of 2000mg/kg body weight. The animals were observed independently at regular intervals subsequent to dosing the initial 24hrs and from that point every day for an aggregate of 14 days. The time at which indications of toxicity appear and disappear was observed methodically and recorded for every animal.

Experimental design

A total number of 30 rats were divided into five groups of six rats each:

Group I : Standard chow pellet (Control).
Group II : Atherogenic Diet (AD).
Group III : AD + Ethanolic extract of *Saccharum spontaneum* (200mg/kg B.Wt)
Group IV : AD + Ethanolic extract of *Saccharum spontaneum* (400mg/kg B.Wt)
Group V : AD + standard drug atorvastatin (1.2 mg/kg body weight)

The ethanolic extract and atorvastatin were suspended in 2% tween 80[11] individually and fed to the relevant rats by oral intubation. In the ethanolic extract at the dose level of 200 and 400mg/kg were fixed as per the OECD guidelines. At the end of 9 weeks all the rats were sacrificed by cervical dislocation after overnight fasting. Just before sacrifice, blood was collected from the retro-orbital sinus plexus under mild ether anesthesia and blood sample collected in heparinised tubes and plasma was separated. Liver, heart and aorta were cleared of adhering fat, weighed accurately and used for the preparation of homogenate. Animals were given enough care as per the Animal Ethical Committee's recommendations.

Biochemical analysis

Plasma samples were estimated for total cholesterol, HDL-cholesterol and triglycerides utilizing Boehringer Mannheim kits by Erba Smart Lab analyzer USA. LDL-cholesterol and VLDL-cholesterol were determined by utilizing Friedwald method[12]. Ester cholesterol[13] and free cholesterol[13] were estimated by utilizing digitonin. Segments of liver, heart and aorta tissues were blotted, measured and homogenized with methanol (3 volumes) and

the lipid extracts were gotten by the method of Folch *et al* (1957) [14]. Extract was utilized for the estimation of ester cholesterol and free cholesterol, triglycerides[15], and phospholipids[16]. Free fatty acids were estimated by using method of Falholt *et al* (1973) [17]. Plasma total cholesterol: HDL-cholesterol ratio and LDL-cholesterol: HDL-cholesterol ratio was also calculated to access the atherogenic risk[18], cardiac risk ratio[19] and Atherogenic coefficient[20].

Statistical analysis

The results were expressed as mean ± standard deviation of 6 rats in each group. The statistical significance between the groups was carried out by using one way ANOVA as in standard statistical software package of social science (SPSS).

RESULTS

From the acute toxicity it was found that the ethanolic extract are safe up to 2000mg/kg thus one tenth of this dose (200mg/kg) was considered as the assessment dose. Since shown in Table1.The body weight of group II rats were increased significantly ($p<0.001$) in comparison with normal control group I rats. The increment in the weight was reduced considerably ($p<0.001$) by the administration of ethanolic extract of *Saccharum spontaneum* (400mg/kg) also standard atorvastatin in comparison with the group II AD fed rats (group II). The average food intake per rat per day was found to be 20.5±1.0g. Food intake was the same in all the AD rats.

Table 1 Body weight variation in control and experimental wistar rats

Groups	Initial weight (g)	Final weight (g)	Average body weight gain (g)
Group I	137.91±1.74^{bNS}	173.06±2.38 ^{b*}	35.26±4.39 ^{b*}
Group II	135.84±2.53^{aNS}	253.14±8.58^{a*}	117.44±6.05^{a*}
Group III	149.66±1.26$^{aNS, bNS}$	219.90±7.51$^{aNS, b*}$	70.33±5.87 $^{aNS, b*}$
Group IV	152.58±2.32^{aNS,bNS}	194.78±3.10$^{aNS, b**}$	42.26±3.34 $^{aNS, b*}$
Group V	176.83±2.29$^{aNS, bNS}$	217.47±3.78$^{aNS, b*}$	40.74±3.37 $^{aNS, b*}$

Values are expressed as mean ± SE (n=6 rats)
*P values : *<0.001, **<0.05*
NS: Non significant
a →group I compared with groups II, III, IV, V.
b →group II compared with groups III, IV, V.
Group I: Standard chow pellet (Control).
Group II: Atherogenic diet.
Group III: AD + Ethanolic extract of Saccharum spontaneum (200mg/kg b.wt)
Group IV: AD + Ethanolic extract of Saccharum spontaneum (400mg/kg b.wt)
Group V: AD + Standard drug atorvastatin (1.2 mg/kg b.wt)

As shown in Table 2. There was a significant increase ($p<0.001$) in the level of plasma total cholesterol, ester cholesterol, free cholesterol, free fatty acid, phospholipids and triglycerides in the group II rats fed with AD in comparison with the normal untreated control rats (Group I). Treatment with ethanolic extract of *Saccharum spontaneum* at the dose 200mg/kg body weight was showed considerably reduced ($p<0.001$) in the level of plasma total cholesterol, ester cholesterol, free cholesterol, free fatty acid phospholipids and triglycerides in comparison with group II AD rats. However, group IV (ethanolic extract of *Saccharum spontaneum* with AD) showed that the plasma total cholesterol, ester cholesterol, free cholesterol, free fatty acid phospholipids and triglycerides level was restored to near normal as that of group V (atorvastatin 1.2mg/kg with AD).

Table 2 Effect on plasma lipid profile by using ethanolic extract of *Saccharum spontaneum* in control and experimental wistar rats

Groups	Total cholesterol (mg/dl)	Free cholesterol (mg/dl)	Ester cholesterol (mg/dl)	Free fatty acid (mg/dl)	Phospholipid (mg/dl)	Triglyceride (mg/dl)
Group I	117.32 ± 0.83 ^{b*}	26.54± 0.18 ^{b*}	90.72± 1.51 ^{b*}	40.60± 0.27 ^{b*}	100.70± 0.12 ^{b*}	70.88± 0.95 ^{b*}
Group II	175.90 ±2.59 ^{a*}	45.02± 0.18 ^{a*}	130.92± 0.92 ^{a*}	59.66± 0.13 ^{a*}	141.44± 0.26 ^{a*}	111.44± 0.67 ^{a*}
Group III	128.33 ±1.58 $^{a**, b*}$	35.26± 0.38 $^{a*, b*}$	93.08± 1.16 $^{a**, b*}$	46.26± 0.13 $^{a*, b*}$	115.26± 0.17 $^{a*, b**}$	79.36± 0.37 $^{a*, b**}$
Group IV	105.08 ±0.81 $^{a*, b*}$	27.32± 0.30 $^{a*, b*}$	78.50± 0.41 $^{a*, b*}$	40.56± 0. 32 $^{a*, b*}$	102.08± 0. 29 $^{a*, b*}$	60.26± 0. 35 $^{a*, b*}$
Group V	102.55 ±2.58 $^{a*, b*}$	26.00± 0.21 $^{a*, b*}$	76.36± 1.21 $^{a*, b*}$	39.44± 0.16 $^{a*, b*}$	99.62± 0.15 $^{a*, b*}$	57.46± 0.32 $^{a*, b*}$

*Values are expressed as mean ± SE (n=6 rats), P values : * < 0.001, ** < 0.05, NS: Non Significant*

As shown in Table 3. In the AD group, there was a significant increase in the value of atherogenic index 4.39± 0.04 ($p<0.001$), while the group receiving ethanolic extract of *Saccharum spontaneum* along with atherogenic diet,

showed a significant decrease in atherogenic index 1.79±0.02 (p<0.001), comparable to the normal control group 1.97±0.02 (p<0.001).

Table 3 Effect on plasma lipid profile by using ethanolic extract of *Saccharum spontaneum* in control and experimental wistar rats

Groups	Athrogenic index	Cardiac risk ratio	Atherogenic Coefficient
Group I	1.97± 0.02 ^{b*}	1.98± 0.02 ^{b*}	0.98±0.02 ^{b*}
Group II	4.39± 0.04 ^{a*}	4.38±0.56 ^{a*}	3.38± 0.04 ^{a*}
Group III	2.06± 0.05 $^{a*, b*}$	2.59±0.39 $^{a*, b**}$	1.59±0.02 $^{a*, b*}$
Group IV	1.79± 0.02 $^{a*, b*}$	1.84±0.03 $^{a*, b*}$	0.84±0.02 $^{a*, b*}$
Group V	1.75± 0.02 $^{a*, b*}$	1.76±0.03 $^{a*, b*}$	0.76±0.02 $^{a*, b*}$

Values are expressed as mean ± SE (n=6 rats), P values: * < 0.001, ** < 0.05, NS: Non Significant

As shown in Table 4. The lessening in the HDL produced by the group of animals fed with AD was significant (P<0.001) in comparison with group I control animals. However, the treatment with ethanolic extract of *Saccharum spontaneum* at the dose of 400 mg/kg considerably increment the HDL-cholesterol level when compared to group II AD rats. The increased levels of LDL and VLDL-cholesterol in group II rats fed with AD was significant (P<0.001) in comparison with group I control rats. Treatment with ethanolic extract of *Saccharum spontaneum* (Group IV) markedly reduced the level of plasma LDL-cholesterol and VLDL-cholesterol when compared to group II AD rats. In comparison of the two dose of extract group (Group III & IV) with group II AD rats, the ethanolic extract of *Saccharum spontaneum* at the dose of 400 mg/kg was revealed considerable reduction on both LDL-cholesterol and VLDL-cholesterol. The atherogenic diet rats caused significant (P<0.001) increase in the ratios of total cholesterol: HDL-cholesterol and LDL-cholesterol: HDL-cholesterol. A significant (p<0.001) increase in the ratios of total cholesterol: HDL-cholesterol and LDL- cholesterol: HDL-cholesterol in the rat fed with AD (group II) in comparison with normal untreated rats (Group I) Administration of ethanolic extract of *Saccharum spontaneum* along with AD was found significantly reduced the ratios of total cholesterol: HDL-cholesterol and LDL-cholesterol: HDL-cholesterol when compared to AD group (II).

Table 4 Effect on plasma lipoprotein by using ethanolic extract of *Saccharum spontaneum* in control and experimental wistar rats

Groups	HDL cholesterol (mg/dl)	LDL cholesterol (mg/dl)	VLDL cholesterol (mg/dl)	LDL- c/HDL-c ratio	HDL-c/ TC ratio
Group I	59.23±0.36 ^{b*}	43.91±0.45 ^{b*}	14.18±0.15 ^{b*}	0.74±0.02 ^{b*}	0.50±0.03 ^{b*}
Group II	40.12±0.45 ^{a*}	113.06±0.23 ^{a*}	22.72±0.17 ^{a*}	2.82±0.09 ^{a*}	0.23±0.01 ^{a*}
Group III	49.56±0.33 $^{a**, b*}$	62.90± 0.34 $^{a*, b*}$	15.87±0.05 $^{a*, b*}$	1.27±0.03 $^{a**, b*}$	0.39±0.01 $^{a*, b*}$
Group IV	57.08± 0.36 $^{a*, b*}$	35.95± 0.15 $^{a*, b*}$	12.05± 0.03 $^{a*, b*}$	0.63±0.02 $^{a*, b*}$	0.54±0.02 $^{a*, b*}$
Group V	58.11±0.35 $^{a*, b*}$	32.95± 0.36 $^{a*, b*}$	11.49±0.06 $^{a*, b*}$	0.57±0.01 $^{a*, b*}$	0.57±0.01 $^{a*, b*}$

Values are expressed as mean ± SE (n=6 rats), P values : * < 0.001, ** < 0.05

As shown in Tables 5&6. The considerable (P<0.001) raise in levels of both free cholesterol and ester cholesterol were also observed in tissue of group II rats fed atherogenic diet when compared to group I control rats. The atherogenic diet rats with ethanolic extract of *Saccharum spontaneum* at the dose of 400 mg/kg, both the tissues cholesterol like ester and free cholesterol reduced remarkably.

Table 5 Effect on tissues ester cholesterol profile by using ethanolic extract of *Saccharum spontaneum* in control and experimental wistar rats

Groups	Ester cholesterol (mg/g tissue)		
	Liver	Heart	Aorta
Group I	1.90± 0.05 ^{b*}	2.69± 0.08 ^{b*}	1.98±0.06 ^{b*}
Group II	3.23±0.15 ^{a*}	7.02±0.11 ^{a*}	6.84±0.28 ^{a*}
Group III	2.15±0.06 $^{a**, b*}$	3.30±0.07 $^{a*, b**}$	3.32±0.15 $^{aNS, b**}$
Group IV	1.96±0.07 $^{a*, b*}$	2.96±0.05 $^{a*, b*}$	2.88±0.24 $^{a*, b*}$
Group V	1.94±0.07 $^{a*, b*}$	2.94±0.05 $^{a*, b*}$	2.82±0.15 $^{a*, b*}$

Values are expressed as mean ± SE (n=6 rats) P values: * < 0.001, ** < 0.05

Table 6 Effect on tissues free cholesterol profile by using ethanolic extract of *Saccharum spontaneum* in control and experimental wistar rats

Groups	Free cholesterol (mg/g tissue)		
	Liver	Heart	Aorta
Group I	0.82±0.03 ^{b*}	0.72±0.03 ^{b*}	0.45±0.01 ^{b*}
Group II	1.30±0.07 ^{a*}	1.05±0.07 ^{a**}	2.37±0.10 ^{a*}
Group III	1.02±0.07 $^{a**, b*}$	0.81±0.05 $^{a*, b*}$	0.98±0.05 $^{a**, b**}$
Group IV	0.88±0.02 $^{a*, b*}$	0.65±0.02 $^{a*, b*}$	0.71±0.02 $^{a*, b*}$
Group V	0.86±0.04 $^{a*, b*}$	0.63±0.03 $^{a*, b*}$	0.63±0.03 $^{a*, b*}$

Values are expressed as mean ± SE (n=6 rats), P values: * < 0.001, ** < 0.05

As shown in Tables 7. The concentration of tissue triglyceride was elevated in group II rats fed with atherogenic diet as compared to group I control rats. The rats treated with ethanolic extracts of *Saccharum spontaneum* at the dose of 200 and 400mg/kg and also atorvastatin (standard drug) along with AD when compared with group II rats fed with atherogenic diet, the extract and standard drug given group rats tissue triglyceride levels were considerably reduced. Administration of ethanolic extract of *Saccharum spontaneum* significantly reduced the triglyceride.

As shown in Tables 8. The concentration tissue phospholipids were significantly increased in group II rats fed AD as compared to group I control animals. Treatment with ethanolic extract of *Saccharum spontaneum* along with AD was showed significantly reduced the phospholipids levels when compared to AD fed group II rats. Administration of ethanolic extract of *Saccharum spontaneum* significantly ($p<0.001$) reduced the phospholipids level.

Table 7 Effect on tissues triglyceride level by using ethanolic extract of *Saccharum spontaneum* in control and experimental wistar rats

Groups	Triglyceride (mg/g tissue)		
	Liver	Heart	Aorta
Group I	8.34±0.01 ^{b*}	10.98±0.01 ^{b*}	10.52±0.03 ^{b*}
Group II	29.14±0.19 ^{a*}	49.10±0.16 ^{a*}	22.86±0.28 ^{a*}
Group III	21.26±0.27 ^{a**,b*}	28.76±0.13 $^{a*, b**}$	17.20±0.09 ^{a**,b*}
Group IV	11.10±0.15 $^{a*, b*}$	19.12±0.20 ^{a*,b*}	12.98±0.11 $^{a*, b*}$
Group V	13.02±0.27 ^{a*,b*}	21.90±0.13 ^{a*,b*}	13.48±0.09 ^{a*,b*}

Values are expressed as mean ± SE (n=6 rats), P values : $^{*} < 0.001$, $^{**} < 0.05$

Table 8 Effect on tissues phospholipids level by using ethanolic extract of *Saccharum spontaneum* in control and experimental wistar rats

Groups	Phospholipids (mg/g tissue)		
	Liver	Heart	Aorta
Group I	19.52±0.15 ^{b*}	23.52 ±0.07 ^{b*}	9.72±0.05 ^{b*}
Group II	28.92±0.09 ^{a*}	36.78±0.12 ^{a*}	16.78± 0.09 ^{a*}
Group III	20.82± 0.05 ^{a**,b*}	32.25±0.15 ^{b*}	12.36 ± 0.12 $^{a*, b**}$
Group IV	18.77 ± 0.11 $^{a*, b*}$	25.49±0.07 $^{a*, b*}$	10.76± 0.13 ^{a*,b*}
Group V	19.35± 0.05 $^{a**, b*}$	27.57±0.15 ^{a*,b*}	11.61± 0.12 $^{a*, b*}$

Values are expressed as mean ± SE (n=6 rats), P values: $^{*} < 0.001$, $^{**} < 0.05$

DISCUSSION

The body weight of atherogenic diet rats were increased significantly, which was reduced significantly by the administration of ethanolic extract of *Saccharum spontaneum.* The weight lessening impact may be ascribed to its capability to restrain lipogenesis and upgraded thermogenesis, since obesity is connected with imperfect thermogenesis[21].

Plasma lipid profiles are raised in the group getting atherogenic diet; prior studies showed noteworthy elevation of lipid parameters in plasma and tissue response to atherogenic diet or high fat diet[22-24]. The lessening in the HDL formed by the group of animals fed with AD, this outcome is exceedingly noteworthy in that low HDL-cholesterol is currently considered as the most critical risk factor for atherosclerosis[25,26]. After oral administration of ethanolic extract of *Saccharum spontaneum* was demonstrated essentially increased the HDL-C concentration. It is surely understood that increased HDL-cholesterol levels have a defensive part in coronary artery disease[27]. HDL may be defensive by reversing cholesterol transport, inhibiting the oxidation of LDL and by neutralizing the atherogenic impacts of oxidized LDL[28]. The increased levels of LDL and VLDL-cholesterol in rats fed with AD, Clinical and epidemiological studies have demonstrated that people with elevated LDL demonstrate an increased risk for cardiovascular diseases[29]. Supplementation of cholesterol in diet rapidly results in a marked increase in the production of cholesteryl rich-VLDL by the liver and intestine[30] and a reduced number as well as rate of cholesterol removal by the hepatic LDL receptors[31]. The level of LDL-C and HDL-C were significantly reduced by administration of ethanolic extract of *Saccharum spontaneum* treated groups. There is strong evidence from several studies that the extent of reduction in the incidence of CHD is directly related to the magnitude of reduction in LDLc and VLDLc levels[32].

The atherogenic diet rats significantly increased in the ratios of total cholesterol: HDL-cholesterol and LDL-cholesterol: HDL-cholesterol. A significant increased in the ratios of total cholesterol: HDL-cholesterol and LDL-cholesterol: HDL-cholesterol indicate increased risk of atherosclerosis and coronary heart disease[33]. Decline in the ratios of total cholesterol: HDL-cholesterol and LDL- cholesterol: HDL-cholesterol observed in the ethanolic extract of *Saccharum spontaneum* treated rats (group V) might be consequence of higher proportion of HDL-cholesterol which reduced risk by virtue of increased reverse cholesterol transport from peripheral organs to liver[34,35].

The ester and free cholesterol levels were significantly increased in AD group (II) in comparison with control rats. This elevated cholesterol concentration in blood may harm the endothelial cells lining the extensive supply routes like arteries and aorta and this may be an introductory occurrence in the etiology of atherosclerosis[36]. Treatment with ethanolic extract of *Saccharum spontaneum* diminishes the level of both ester and free cholesterol. This lipid bringing impact may be because of the restraint of hepatic cholesterogenesis or because of the increment in emission of fecal sterol[37].

The concentration of plasma and tissue triglyceride was elevated in rats fed with atherogenic diet. Recent studies also show that triglycerides are independently related to coronary heart disease[38,39] and most of the antihypercholesterolemic drugs do not decrease triglycerides levels, but ethanolic extract of *Saccharum spontaneum* lowered it significantly (P<0.001) and this effect might be related to increase the endothelium bound lipoprotein lipase which hydrolyses the triglycerides into fatty acids. Due to decreased phospholipase activity, the concentration of plasma and tissue phospholipids were significantly increased in rats fed with AD[40,41]. The group receiving ethanolic extract of *Saccharum spontaneum* significantly reduced the phospholipids. The plant extract may have incitement of lipoprotein lipase performance bringing about diminish of plasma triglyceride and might enhance the uptake of triglyceride from plasma by skeletal muscle and fat tissues like adipose tissues[42].Administration of ethanolic extract of *Saccharum spontaneum* significantly (p<0.001) reduced the phospholipids level.

In conclusion, the result of present study revealed that the ethanolic extract of whole plant of *Saccharum spontaneum* significantly reduced the plasma lipid and lipoprotein profile, thus reduced the atherogenic index. It also the significantly reduced the tissues free cholesterol, ester cholesterol, triglycerides and phospholipids. This finding provides some biochemical basis for the use of ethanolic extract of whole plant of *Saccharum spontaneum* as antihyperlipidemic agent having preventive and curative effect against hyperlipidemia. Further, studies are required to again more insight in to the possible mechanism of action.

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