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Research Article

Effect and evaluation of antihyperlipidemic activity of fractions of total methanol extract of *Salvadora oleoides (decne.)* leaves on Triton WR-1339 (Tyloxapol) induced hyperlipidemic rats

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ABSTRACT

Hyperlipidemia is the greatest risk factor of coronary heart disease. Currently available hypolipidemic drugs have been associated with number of side effects. Herbal treatment for hyperlipidemia has no side effects and is relatively cheap and locally available. The present study focus on the anti-hyperlipidemic activity of fractions of total methanol extract of leaves of *Salvadora oleoides (Decne.)* against Triton WR-1339 induced hyperlipidemia in rats. Fractions administered a dose of 100mg/kg (oral) to the Triton WR-1339 induced hyperlipidemic rats. Butanol fraction showed significant reduction ($p<0.05$) in serum cholesterol (61.73 mg/dl), triglyceride (121.25 mg/dl), LDL (37.89 mg/dl), VLDL (24.98 mg/dl) and increase in HDL level (36.44 mg/dl) in comparison with standard drug fenofibrate ($p<0.05$).

Keywords: *Salvadora oleoides (Decne.);* Triton WR-1339; Anti-hyperlipidemic; Tyloxapol; Atherosclerosis; fenofibrate.

INTRODUCTION

Disorders of lipid metabolism, hyperlipidemia, hypertension and obesity are associated with increased oxidative stress and overproduction of oxygen free radicals. An excess of superoxide anions (O_2) are further converted into other reactive oxygen species and among them hydroxyl radical (OH) is more damaging to lipids and lipoproteins. Moreover, hyperlipidemia following oxidative stress may cause oxidative modifications in low density lipoproteins, which play an important role in the initiation and progression of atherosclerosis and related cardiovascular diseases (Kumar V. et. al., 2010).

Salvadora oleoides (Decne.), belonging to family Salvadoraceae commonly found in Western region in India. An evergreen plant or shrub or a small tree. Bark is grey or whitish grey, Leaves linear-lanceolate, coriaceous, Flower sessile, greenish white minute in paniculate spikes, drupes globose, usually yellow when ripe, seeds are greenish yellow 3 m in diameter (Wealth of India, 1999). Leaves are used as purgative and as cure of cough. Leaves and stem are used for diabetes and hypercholestremia (Yadav J. P., 2008).

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EXPERIMENTAL

Drug and chemicals

Triton WR-1339 was purchased from Fisher Scientific, Belgium. Total cholesterol, triglyceride and HDL estimation was done using the Seimen Diagnostic Kit. All solvents were purchased from Rankem ltd.

Plant material

Leaves of *Salvadora oleoides (Decne.)* were collected from Delhi (India). The plant material was deposited and authenticated by the Botanical Survey of India, Dehradun. Authenticated specimen number is Acc. No. 113246 and also authenticated by Dr. H. B. Singh, NISCAIR, New Delhi, reference no. NISCAIR/ RHMD/ Consult/2010-11/1675/273 and voucher specimen sample is preserved in Dept. of Pharmaceutical Sciences, S. B. S. P. G. I., Balawala, Dehradun for further reference.

The plant material was dried under shade and powdered. The 500g powdered material was extracted with methanol by cold percolation for 1 week. The extract was evaporated to dryness to obtain a residue of 114 g (Agarwal S. S and Paridhavi M., 2009). From total methanol extract, preparation of different plant extracts by cold percolation method using increasing polarity of

solvents by separation technique i.e Petroleum ether, Chloroform, Ethyl acetate and Butanol.

Animals

Adult albino rats of both sexes weighing 180-300 gm were procured from disease free CPCSEA approved animal house (Reg. no. 273/CPCSEA) of S. B. S. P. G. I. Dehradun. The Institutional Animal Ethics Committee (IAEC) approved the study.

Antihyperlipidemic study

Antihyperlipidemic studies were carried out and total cholesterol, triglycerides, HDL, LDL and VLDL level in the blood were checked.

Induction of hyperlipidemia

A single dose (350 mg/kg body weight i.p) of Triton WR-1339 used for induction of hyperlipidemia in the rats (Schurr P. E., et. al. 1972). The test and standard drugs were administered continuously for 7 days orally using infant feeding tube (Saravana K. A. et. al. 2008).

Collection of blood and experimental setup

The rats were anaesthetized and blood samples were taken. The rats were divided into 7 groups having 6 animals in each group as follows:

Normal Group I: normal diet only

Control Group II: received 1% tween 80 at a dose of 1 ml/kg b.w.

Group III: received Petroleum ether fraction in 1% tween 80 at a dose of 100 mg/kg b.w.

Group IV: received Chloroform fraction in 1% tween 80 at a dose of 100 mg/kg b.w.

Group V: received Ethyl acetate fraction in 1% tween 80 at a dose of 100 mg/kg b.w.

Group VI: received Butanol fraction in 1% tween 80 at a dose of 100 mg/kg b.w.

Group VII: received fenofibrate in 1% tween 80 at a dose of 65 mg/kg b.w.

Blood cholesterol, triglycerides, LDL, HDL and VLDL profile were estimated before starting the treatment and end of the treatment period i.e.7 days.

Estimation of blood cholesterol and lipid profile

Cholesterol, triglycerides and HDL profile were estimated using standard monograph.

LDL cholesterol was calculated as (William T. F., et. al. 1972)

LDL = Total Cholesterol - HDL - Triglycrides/5

VLDL was calculated using the formula (William T. F., et. al. 1972):

VLDL = Triglycerides/5

Table 1: Effect of different fractions of Salvadora oleoides (Decne.) on cholesterol, triglycerides, HDL level in plasma of control and experimental rats

Groups	Cholesterol (mg/ml)	Triglycerides (mg/ml)	HDL (mg/ml)
Group I: Normal	69.21±1.5	157.60±5.75	17.32±0.42
Group II: Control + Triton	186.63±1.62*	189.20±2.60*	21.00±0.6*
Group III: Pet. Ether fraction + Triton	105.78±4.96**	146.20±20.10*	28.65±1.39**
Group IV: Chloroform fraction + Triton	122.75±8.95**	$177.47±30.34^{ns}$	29.23±0.53**
Group V: Ethyl acetate fraction + Triton	135.94±1.69**	118.63±4.36**	$21.46±0.41^{ns}$
Group VI: Butanol fraction + Triton	61.73±2.03**	121.25±7.99**	36.44±1.03**
Group VII: Standard (fenofibrate) + Triton	65.24±1.68**	77.96±3.9**	25.87±1.6**

Value are in mean±SEM, No. of animals in each group N=6, *Significantly different from normal group (p*<0.05), **Significantly different from Group II (p**<0.05), ^{ns} non-significant different from Group II (p<0.05).

Table 2: Effect of different fractions of Salvadora oleoides (Decne.) on LDL and VLDL level in plasma of control and experimental rats

Groups	LDL (mg/ml)	VLDL (mg/ml)
Group I: Normal	21.64±0.67	14.23±0.41
Group II: Control + Triton	127.69±12.43*	37.97±2.11*
Group III: Pet. Ether fraction + Triton	60.78±0.77**	$29.46±4.04^{ns}$
Group IV: Chloroform fraction + Triton	58.24±14.89**	$35.65±6.07^{ns}$
Group V: Ethyl acetate fraction + Triton	90.30±1.08**	23.53±0.89**
Group VI: Butanol fraction + Triton	37.89±0.7**	24.98±1.29**
Group VII: Standard (fenofibrate) + Triton	23.77±0.63**	15.59±3.8**

Value are in mean±SEM, No. of animals in each group N=6, *Significantly different from normal group (p*<0.05), **Significantly different from Group II (p**<0.05). ^{ns} non-significant different from Group II (p<0.05).

Statistical analysis

All results are expressed as the mean±SEM. The results were analysed for statistical significance by Dunnett test of one-way ANOVA test.

RESULT AND DISCUSSION

Results have shown in table 1 and 2, and figure 1, 2, 3, 4 and 5. Earlier we have reported the total methanol extract shows significant reduction in cholesterol and triglyceride level (Kumar D., et. al. 2011)**.** Therefore in search of active principle fractionation of methanol extract was carried out. There was elevation in plasma cholesterol, triglycerides, HDL, LDL and VLDL level in response to induction of Triton WR- 1339 as compare to normal and control group. All the results were statistically significant ($p<0.05$) and compared with normal and control group. Thus among all fractions butanol fraction showed significant reduction in plasma cholesterol (61.73 mg/dl), triglyceride (121.25 mg/dl), LDL (37.89 mg/dl), VLDL (24.98 mg/dl) and increase in HDL level (36.44 mg/dl) as we know that HDL is good for health.

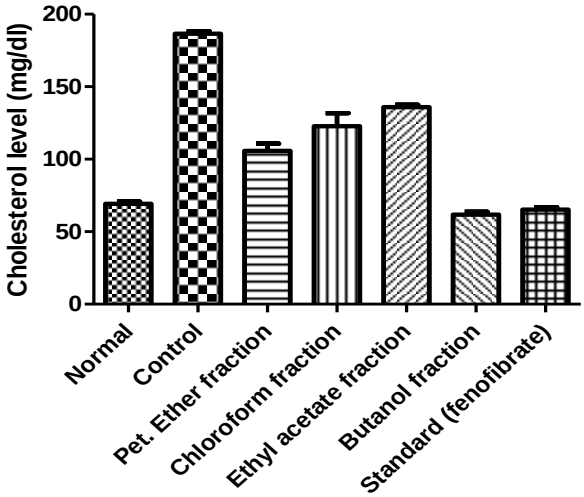

Figure 1: Showing effect of fractions on plasma cholesterol level in Triton induced hyperlipidemic rats

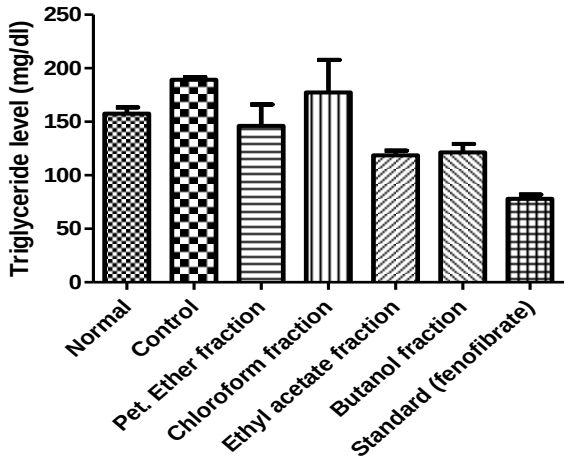

Figure 2: Showing effect of fractions on plasma triglyceride level in Triton induced hyperlipidemic rats

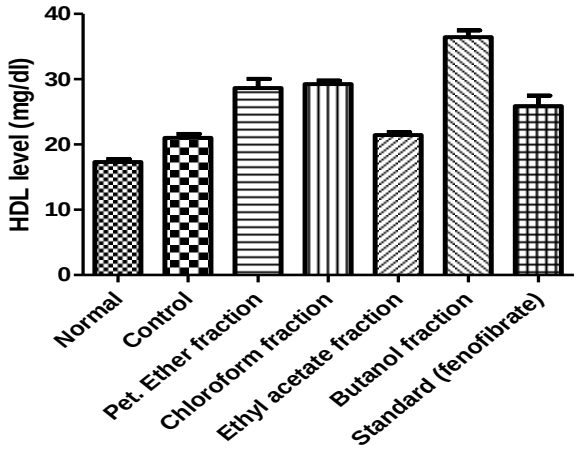

Figure 3: Showing effect of fractions on plasma HDL level in Triton induced hyperlipidemic rats

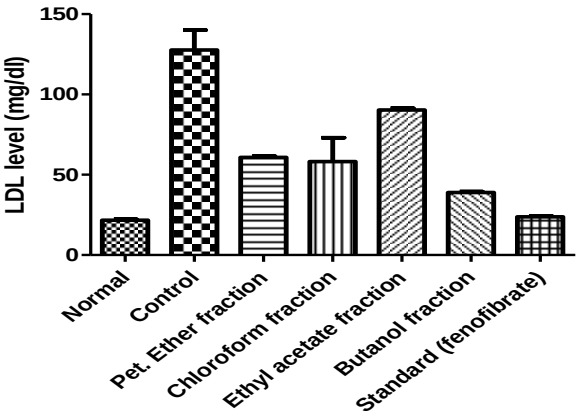

Figure 4: Showing effect of fractions on plasma LDL level in Triton induced hyperlipidemic rats

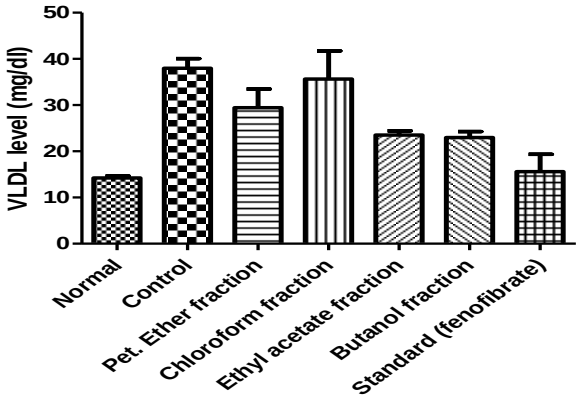

Figure 5: Showing effect of fractions on plasma VLDL level on Triton induced hyperlipidemic rats

Despite significant medical advances, heart attacks due to coronary artery disease and stroke are responsible for more deaths than other causes combined (Rachh, P. R. et. al., 2010).

All the results were statistically significant ($p<0.05$) and compared with normal and control group. Ample of evidence exists with respect to the fact that HDL cholesterol is inversely related to total body cholesterol and a reduction of plasma HDL cholesterol concentration may accelerate the development of atherosclero-

sis leading to ischaemic heart diseases, by impairing the clearing of cholesterol from the arterial wall (Dhulasavant V. et. al. 2010). Flavonoids are reported to increase HDL concentration and decrease in LDL and VLDL levels in hypercholesteremic rats (Patel D. K. et. al. 2009).

The protective effect of the leaves of *Salvadora oleoides (Decne.)* on Triton WR-1339 induced hyperlipidemia may be attributed to a decrease in cholesterol synthesis, an increase in cholesterol excretion and expression of LDL receptor and subsequent catabolism and also increase in HDL cholesterol.

CONCLUSION

From the above study it could be concluded that butanol fraction of *Salvadora oleoides (Decne.)* not only have resulted in significant reduction in cholesterol, triglyceride, LDL, VLDL level but also increases the HDL level. Studies on the isolated fractions and constituents are needed to elucidate mechanisms by which *Salvadora oleoides (Decne.)* exert protective effects on hyperlipidemia.

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