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Hypolipidemic and antioxidant potential of hydroalcholic leaf extract of *Talinum portulacifolium* against Triton WR-1339 induced dyslipidemia in experimental animals

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ABSTRACT

Talinum portulacifolium which is known as water plant is traditionally used for its various properties and hence in present study hydroalcoholic extract of plant leaves has been screened for its hypolipidemic activity. Hyperlipidemia is a highly prognostic risk factor for atherosclerosis, coronary artery diseases and cerebrovascular diseases. Triton WR-1339, a non ionic surfactant has been widely used to produce acute dyslipidemia in animal models in order to screen hypolipidemic activity of the extract and serum levels of various biochemical parameters such as total cholesterol, triglycerides, LDL, VLDL and HDL cholesterol and atherogenic index were determined. The animals are grouped into normal, Triton treated group, Triton + Standard, Triton + herb extract (200mg/kg) and Triton + herb extract (400mg/kg). The plant extract showed significant hypolipidemic effect by lowering all biochemical parameters and increases HDL cholesterol levels. These biochemical observations are also confirmed by Histopathological examination of liver. The plant extract also showed good antioxidant potential by increasing SOD, CAT, GSH and decreasing lipid peroxidation.

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INTRODUCTION

Experimental and epidemiological studies shown that the plasma hypercholesteremic state could contribute to the development of atherosclerosis and related cardiovascular diseases which are the most common cause of death in both western and eastern societies (Nilsson P M *et al.,* 2014). Triton WR-1339, a non ionic detergent (oxyethylated tertiary octyl phenol formaldehyde polymer) has been generally used to produce acute dyslipidemia in animal models in order to screen natural or chemical drugs (Schurr PE *et al.,* 1972), and to study cholesterol and triglyceride metabolism (Ghatak SB *et al.,* 2012). The accumulation of plasma lipids by this detergent appears to be especially due to inhibition of lipoprotein lipase activity (Scharwey M *et al.,* 2013). Hyperlipidemia is a highly predictive risk factor for atherosclerosis, coronary artery diseases (Elhissi JH *et al.,* 2014). Hyperlipidemia associated lipid disorders are considered to cause atherosclerotic cardiovascular diseases (Saravanan R *et al.,* 2003).

Atherosclerosis of arteries is a generalized disease of arterial network known as progressive and silent killer disease characterized by formation of lesions called atherosclerotic plagues in the walls of large and medium sized coronary arteries and reduces blood flow to myocardium called coronary

artery disease (Mohale DS *et al.,* 2008). 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 intestines (Gramza A *et al.,* 2005).

The aim of this study was to evaluate the hypolipidemic and antioxidant activities of hydroalcoholic extract of *Talinum portulacifolium* leaves related to both human health condition and interest in the development of new drugs.

Talinum portulacifolium leaves are used to treat polyuria, internal heat, measles, GIT ailments, hepato protection and also for hypoglycemic activity. This leaves are frequently used for cooking purpose also.

MATERIALS AND METHODS

Plant material

The plant material was collected at S.V.Government Polytechnic, Tirupati during rainy season and the same was authentified by Department of Dravya Guna, S. V. Ayurvedic College, Tirupati.

Preparation of plant extract

The fresh leaves of *Talinum portulacifolium* were shade dried. The coarse power is subjected to cold maceration process using hydro alcohol as solvent (70:30 Water: Ethanol) for 72 hrs. The filtrate is concentrated; residue was reconstituted in distilled water and stored in refrigerator.

Animals

Healthy Sprague Dawley rats, weighing 150-200g were housed at 22±1°C under 12 hrs light-dark cycle. Animals were allowed free access to food and water. The experimental protocol of the present study was approved by Institutional animal Ethical Committee (IAEC No: 1016/A/CPCSEA/ 014/ 2013) and the experiments were carried out as per CPCSEA guidelines.

Acute toxicity studies

According to OECD-423 guidelines acute oral toxicity was performed. No toxicity was produced in different animals which were fed with doses of 50, 300, 1000 and 2000 mg/kg and observed continuously for 24hrs to detect behavioral, neurological and autonomic parameters.

Induction of Hyperlipidemia by Triton

A non ionic surfactant triton WR-1339 induced Hyperlipidemia within 24hrs by the dose of 200mg/kg B.W. intraperitoneally diluted in normal saline (Khanna AK *et al.,* 2002).

Experimental design

Experimental schedule was conducted for 8 days. 30 Rats were divided into 5 groups each consisting of 6 animals. The first group received only the vehicle i.e. normal saline. Second group received vehicle up to 7 days +Triton WR-1339 (200mg/kg B.W) dissolved in normal saline on 8th day. Third group was given Rosuvastatin (1mg/kg B.W) for 7 days and Triton WR-1339 (200mg/kg B.W) on 8th day. Fourth group was given HATP (200mg/kg B.W) in normal saline p.o for 7 days + Triton on 8th day. Fifth group was given HATP (400mg/kg B.W) P.O for 7 days and Triton on 8th day. Blood samples were withdrawn from the retro orbital venous plexus of rats for separation of serum at the end of treatment schedule. The serum samples were analyzed for biochemical estimation of lipid parameters.

Instruments used

Analytical UV-Visible Spectrophotometer, Electric balance, Cooling centrifuge, Homogenizer.

Bio chemical studies

The lipid profiles such as total serum cholesterol, TG, HDL cholesterol, LDL, VLDL, Atherogenic index, LDL/HDL ratio were studied. Liver homogenate was tested for SOD, CAT, GSH and lipid peroxidation. On 8th day, at the end of treatment schedule, Histopathological study of liver was also carried out.

Statistical analysis

All results were expressed as mean ± S.E.M and statistically analyzed by one way ANOVA and two way ANOVA followed by Bonferroni test for multiple comparison. All the statistics were performed prism graph pad version 5.0 and statistically significance set at $p<0.001$.

RESULTS

Preliminary phytochemical screening

Preliminary phytochemical screening of the hydroalcoholic extract of leaves of *Talinum portulacifolium* was shown the presence of alkaloids, flavonoids, glycosides, carbohydrates, saponins and tannins.

DISCUSSION

Hyperlipidemia causes about 17 million deaths worldwide each year; (WHO, 2011) in addition, it is also a key factor for the development of heart, coronary diseases and atherosclerosis.

Many studies have proved that reactive oxygen species and free radicals play a major role in maintaining human health. When the balance between generating and scavenging of ROS and free radicals in-vivo is destroyed, an oxidative stress would hap-

Table 1: Effect of *Talinum portulacifolium* on serum lipid parameters (Total cholesterol, Triglycerides, VLDL-C)

S. No	Group	Total cholesterol	Triglycerides	VLDL-C
I	Normal	99 ±1.1	110 ± 0.48	22 ± 0.41
II	Triton	153 ± 2.4###	137 ± 0.85###	28 ± 0.065###
III	Rosuvastatin + Triton	96 ± 2.2***	128 ± 0.65***	22 ± 0.065***
IV	Test drug 200mg/kg	78 ± 0.48***	91 ± 1.06***	18 ± 0.25***
V	Test drug 400mg/kg	99 ± 0.29***	111 ± 0.65***	22 ± 0.048***

All values shown are mean ± SEM and n=6; ### indicates p<0.001 when compared with Normal groups; *** P<0.001. ** P<0.01, * P<0.05.

Table 2: Effect of *Talinum portulacifolium* on serum lipid parameters (HDL-C, LDL-C, LDL/HDL Ratio)

S. No	Groups	HDL-C	LDL-C	LDL/HDL Ratio
I	Normal	51 ± 1.1	26 ± 0.25	0.56 ± 0.0014
II	Triton	24 ± 0.85##	108 ± 0.48###	4.9 ± 0.046###
III	Rosuvastatin + Triton	49 ± 1.3***	39.3 ± 0.075***	0.18 ± 0.0026***
IV	Test drug 200mg/kg	46 ± 1.0***	17 ± 0.028***	0.41 ±0.056***
V	Test drug 400mg/kg	42 ± 0.71***	26 ± 0.24***	0.92 ± 0.0054***

All values shown are mean ± SEM and n=6; ### indicates p<0.001 when compared with Normal groups; *** P<0.001. ** P<0.01, * P<0.05.

Table 3: Effect of *Talinum portulacifolium* on serum lipid parameters (Atherogenic index, Total proteins)

S. No	Groups	Atherogenic index	Total proteins
I	Normal	1.27 ± 0.0068	14.42 ± 0.38
II	Triton	6.20 ± 0.013###	5.66 ± 0.91##
III	Rosuvastatin + Triton	0.73 ±0.0054***	10.10 ± 1.28**
IV	Test drug 200mg/kg	0.90 ± 0.057***	10.97 ± 1.07***
V	Test drug 400mg/kg	1.45 ± 0.0023***	12.06 ± 1.16***

All values shown are mean ± SEM and n=6; ### indicates p<0.001 when compared with Normal groups; *** P<0.001. ** P<0.01, * P<0.05.

pen, which might lead to extensive oxidative damage to cellular biomolecules, such as DNA, proteins and lipids. Many chronic diseases such as hyperlipidemia proved to be associated with the existence of oxidative stress.

Atherosclerosis is a chronic inflammatory diseases triggered by multiple factors, with stray contribution of endothelial damage related to lipid peroxidation. This endothelial dysfunction increases permeation of LDL proteins through the intima layer, resulting in oxidation and formation of atherosclerotic damage (Vogiatzi G *et al.,* 2009, Li H *et al.,* 2014). In order to control this imbalance, the body has enzymatic and non enzymatic antioxidant defense mechanism (Bonomini *et al.,* 2008) capable of preventing the deleterious effects of oxidation, inhibiting lipid peroxidation, free radical scavenging and maintaining redox balance in cells. In addition to endogenous antioxidants, there are antioxidants from exogenous sources. The beneficial effects of foods have been linked to the presence of bioactive compounds and other nutrients (Zonotti I *et al.,* 2015). Thus, plants have been described as an alternative to the development of new drugs (Calixto JB *et al.,* 2005) applied to treatment of many diseases such as hypercholesterolemia, ulcers, depurative blood and cancer (De Souza PM *et al.,* 2012, De Toledo CEM *et al.,* 2011 and Melo F *et al.,* 2009). The importance of new products in the treatment and prevention of dyslipidemia becomes essential to reduce the mortality and morbidity due to cardiovascular complications. In addition, the search for less toxic drugs have increased the interest of the scientific community for natural products. The present extract showed to manage Hyperlipidemia induced by Triton WR-1339 reducing serum levels of total cholesterol and triglycerides without signs of change in hepatic and renal function, suggesting that extract is safe in the evaluated condition. The hypolipidemic action of natural products can be correlated to the pres-

Table 4: Effect of *Talinum portulacifolium* in liver biochemical parameters (SOD, CAT, GSH, LPO Values)

S. No	Groups	*IN VIVO* ANTIOXIDANT LEVELS			PRO-OXIDANT LEVELS
		SOD (U/mg protein)	Catalase (μM H_2O_2 consumed/mg protein)	GSH (μM GSH/mg protein)	LPO (Nm of MDA/mg protein)
I	Normal	1.791±0.43	4.466±0.734	2.843±0.183	2.236±0.401
II	Triton	0.438±0.157##	1.487±0.219##	0.813±0.140##	7.417±1.282###
III	Rosuvastatin	1.670±0.030**	3.819±0.795***	1.597±0.626**	1.597±0.250**
IV	Test 200mg/kg	0.970±0.30**	2.086±0.86**	1.296±0.26**	2.032±0.413***
V	Test 400mg/kg	1.540±0.201***	3.521±0.13***	2.643±0.81***	2.130±0.486***

Values were expressed as means ± S.E.M of 6; ### indicates P<0.001 when compared with Normal groups; *** P<0.001. ** P<0.01, * P<0.05.

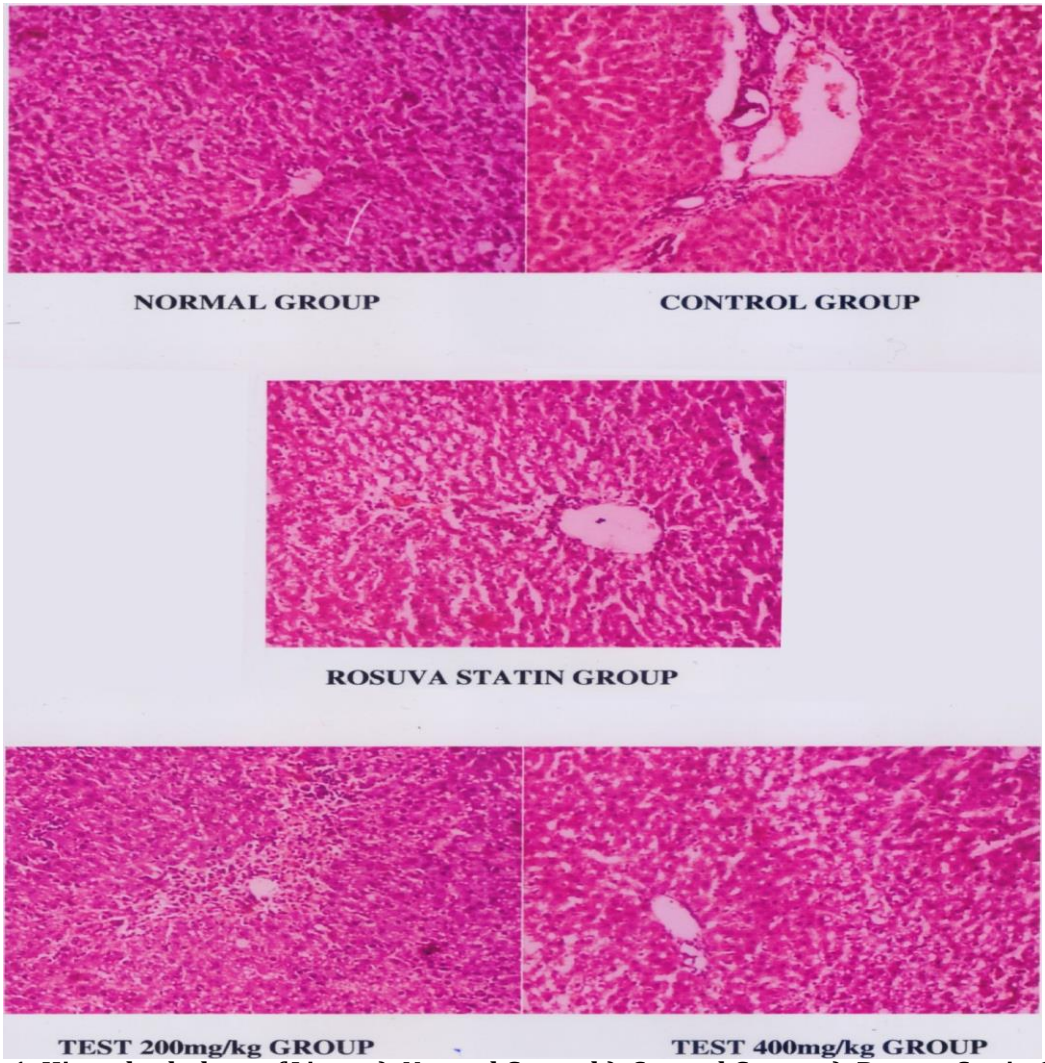

Figure 1: Histophathology of Liver a). Normal Group b). Control Group c). Rosuva Statin Group d). Test 200mg/kg Group e). Test 400mg/kg Group

ence of flavonoids due to their properties of inhibiting cholesterol biosynthesis and absorption and modifying the activity of lipogenic and lipolytic enzymes, leading to reduced lipid metabolism (Borradaile NM *et al.,* 2003, Whitman SC *et al.,* 2005, Brusq JM *et al.,* 2006), as observed in hyperlipidemic rats, treated with extract, which showed significant reduction in levels of total cholesterol and triglycerides. Other molecules able to decrease the serum level of cholesterol are saponins (Patel S

et al., 2012), also present in extract. It is very interesting that extract is able to decrease both serum levels of cholesterol and triglycerides. The present study also reported that the extract reduces the generation of free radicals.

CONCLUSION

These findings indicated that the extract may contain biologically active phytoconstituents that may lower lipid levels and might be beneficial in treat- ment of Hyperlipidemia and atherosclerosis, and the extract also increased the levels of in-vivo anti- oxidants simultaneously reducing lipid peroxida- tion when compared to Triton control groups.

REFERENCES

Bonomini F, Tengattini S, Fabino A, Bianchi R, and Rezzani R, ''Atherosclerosis and oxidative stress'', Histology and Histopathology, Vol. 23, pp.381-390, 2008.

Borradaile NM, De Dreu LE, Barrett PHR, Behrsin CD, and Huff MW, ''Hepaticyte Apo B- containing lipoprotein secretion is decreasesd by the grapefruit flavanoids, naringenin, via inhibition of MTP-mediated microsomal triglycerides accumulation'', Biochemistry, vol. 42, no. 5, pp.1283-1291, 2003.

Brusq JM, Ancellin N, Grondin P *et al.,* ''Inhibition of lipid synthesis through activation of AMP kinase: an additional mechanism for the hypolipidemic effects of berberine, Journal of Lipid Research, vol. 47, no.6, pp. 1281-1288, 2006.

Calixto JB, ''Twenty-five years of research on medicinal plants in latin America: a personal view'', Journal of Ethnopharmacology, Vol. 100, no. 1-2, pp. 131-134, 2005.

De Souza PM, De Sales PM, Simeoni LA, Silva EC, Silveira D, and de Oliveira Magalhaes.P, ''Inhibitory activity of α-amylase and α-glucosides by plant extracts from the Brazilian cerrado'', Planta Medica, Vol. 78, no.4, pp. 393-399, 2012.

De Toledo CEM, Britta EA, Ceole LF *et al.,* ''Antimocrobial and cytotoxic activities of medicinal plants of the Brazilian cerrado, using Brazilian cachaa as extractor liquid'', Journal of Ethnopharmacology, Vol. 133, no. 2, pp. 420-425, 2011.

Elhissi JH, Sukkar DN, El.Sakka MA nutritional attributes as predictors of coronary heart disease. Pharmacol pharm, 5(2014), PP, 1171-1179.

Ghatak S.B, panchal S.J Antihyperlipidemic activity of oryzanol isolated from crude rice bran oil, on triton WR-1339 induced acute Hyperlipidemia in rat. Rev Bras Farmacogn, 22 (3 (2012), PP. 642-648.

Gramza A, Korczak J Tea constituents (camellia sinensisli) as antioxidants in lipid systems Trends food sci Tech, 16 (2005), PP. 351-358. Article PDF (213KB).

Khanna AK, Rizvi F, Chander P lipid lowering activity of phyllanthus niruri in hyperlipidemic rats. J Ethnopharmacol, 82 (2002), PP.19-22. (PDF-87 KB).

Li H, Horke S, and Forstermann U, ''Vascular oxidative stress, nitric oxide and atherosclerosis'', Atherosclerosis, Vol. 237, no.1, pp.208-219, 2014.

Melo e Silva F, De Paula JE, and Espindola LS, ''Evaluation of the antifungal potential of Brazilian Cerrado medicinal plants'', Mycoses, Vol. 52, no.6, pp.511-517, 2009.

Mohale DS, Dewani AP, Saoji AN, Khadse CD Anti hyperlipidemic activity of isolated constituents from the fruits of Lagenaria siceraria in albino rats. Int J Green pharm, 2(2008), PP. 104-107.

Nilsson PM, Olsen MH, Laurent S early vascular aging (EVA); new directions in cardiovascular protection J hypertens, 32 (7) (2014), P. 1470A7.

Patel S, Santani D, Shah M, and Patel V, ''Anti-hyperglecemic and anti-hyperlipidemic effects of bryonia laciniosa seed extract and its saponins fraction in streptozotocin- induced diabetes in rats'', Journal of Young Pharmacists, vol. 4, no. 3, pp.171-176, 2012.

Saravanan R, Rajendra Prasad N, Pugalandi KV effect of piper bettle leaf extract on alcoholic toxicity in the rat brain J Med food, 6(2003), PP.261-265.

Saravanan R, Rajendra Prasad N, Pugalandi.KV effect of piper bettle leaf extract on alcoholic toxicity in the rat brain J Med food, 6(2003), PP.261-265.

Schurr PE, Schultz JR, Parkinson TM Triton induced Hyperlipidemia in rats as an animal model for screening hypolipidemic drugs lipids, 7(1972), PP. 69-74.

Vogiatzi G, Tousoulis D, and Stefanadis C, ''The role of oxidative stress in atherosclerosis'', Hellenic Journal of Cardiology, Vol. 50, no. 5, pp.402-409, 2009.

Whitman SC, Kurowska EM, Manthey JA, and Daugherty A, Nobiletin, ''a citrus flavonoid isolated freom tangerines, selectively inhibits class A scavenger receptor-mediated metabolism of acetylated LDL by mouse macrophages'', Atherosclerosis, vol. 178, no. 1, pp.25-32, 2005.

WHO, Global Atlas on cardiovascular disease prevention and control, Vol.3, World Health Organization, Geneva, Switzerland, 2011.

Zanotti I, Dall'Asta M, Mena P *et al.,* ''Atheroprotective effects of (poly) phenols: a focus on cell cholesterol metabolism'', Food and function, Vol.6. no.1, pp.13-31, 20.