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Antihyperlipidemic effect of *Tagetes erecta* in cholesterol fed hyperlipidemic rats

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ABSTRACT

Natural products serve as lead molecules for development for the many popular drugs. Herbal drugs are having fewer side effects than the other class of drugs which are coming from the synthetic source. Tagetes erecta, the Mexican marigold, also called Aztec marigold, is a species of the genus Tagetes native to Mexico and Central America. In the present study, hydro alcoholic extract of Tagetes erecta was studied for its anti hyperlipidemic activity in hyperlipidemic rats at a dose of 200 and 400 mg/kg. Hyperlipidemia was induced by cholesterol 25mg/kg/day. Lovastatin (10mg/kg/day) was used as standard. Blood samples were collected from rats in all the groups on 30th day and estimated for their serum cholesterol, serum triglyceride, serum HDL and serum LDL levels using standard procedures. From present study it was observed that administration of Tagetes erecta extracts significantly decreased all the hyperlipidemic parameters in rats.

Key words: *Tagetes erecta*, serum cholesterol, serum triglyceride, serum HDL, serum LDL.

INTRODUCTION

Hypercholesterolemia and hypertriglyceridemia are major risk factors either, alone or together. They accelerate the development of coronary artery disease and the progression of atherosclerosis [1]. High levels of low-density lipoprotein (LDL) accumulate in the extracellular sub endothelial space of arteries and are highly atherogenic and toxic to vascular cells thereby leading to atherosclerosis, hypertension, obesity, diabetes, functional depression in some organs, etc [2]. *Tagetes erecta* of the family *compositae* is commonly found in parts of India, Asia, Africa and America. It is known as Marigold. The leaves are reported to be effective against piles, Kidney troubles, muscular Pain, ulcers, wound and earache. The herbs are used for the treatment of inflammatory conditions as a household remedy on experimental basis. The chief chemical constitutions like is volatile oils, tri terpinoids [3] were reported in *Tagetes erecta*. But,

there was no scientific data available on this abundantly found plant in India regarding its hyperlipidemic potential. Hence, in the present study, an attempt was made to study anti hyperlipidemic action of *Tagetes erecta* against cholesterol induced hyperlipidemic rats. The main aim and objective of the work is to extract *Tagetes erecta* whole plant with hydro alcohol as solvent and to screen its anti hyperlipidemic activity in cholesterol induced hyperlipidemic rats at doses of 200 and 400 mg/kg.

MATERIALS AND METHODS

Collection of Plant materials

Tagetes erecta were collected from Kosigi village, Kurnool District of Andhra Pradesh, India and botanically identified and authenticated by K. Madhava Chetty, taxonomist, Department of Botany, Sri venkateshwara University, Tirupati, A.P., and a voucher specimen (RRV/2011/01) was stored in Department of Pharmacology, Vagdevi college of Pharmacy and Research centre, Brahmadevam, Nellore, A.P., India, for future references.

Preparation of extract

Whole plant of *Tagetes erecta* was dried in sun shade and coarsely powdered using mechanical grinder. About 350 gm of this powder was extracted using 90% methanol by continuous hot percolation method in Soxhlet apparatus. The extract was concentrated on rotary flash evaporator to semisolid consistency. To it 1-2 drops of chloroform was added and stored at 8^{o}C in screwed glass vials which was designated as METE [4, 5].

Acute toxicity study

Acute toxicity study was performed according to OECD guideline 423. Animals were fasted prior to dosing, food but not water should be withheld overnight. Following the period of fasting, the animals were weighed and METE was administered. Three animals are used for each step. The dose level of METE to be used at the starting dose of 500, 1000, 1500, 2000, 3000 and 4000 mg/kg body weight. The starting dose level should be that which is most likely to produce mortality in some of the dose animals. After administration of extract, the animals were observed continuously for first 4 hrs for behavioral changes and at the end of 24 hr for mortality rate if any.

Pharmacological studies

Experimental animals

Male Wister albino rats weighing 150-200 gm were used in the present study. They were housed in individual polypropylene cages under standard laboratory conditions of light, temperature, and relative humidity. Animals are given standard rat pellets (Pranav Argo' Ltd) And drinking water *ad libitum.* The experimental protocol was approved by the institutional Animal Ethical Committee of Vagdevi College of Pharmacy And Research Centre, Brahmadevam, Nellore-524346.

Grouping of animals for study

Male Wister Albino rats were randomly divided into five groups consisting of six rats in each group. Group I serves as normal control received vehicle i.e. 1.0% w/v sodium CMC, group II serves as hyperlipidemic group received cholesterol 25 mg/kg/day in oil, group III was treated with Lovastatin 10 mg/kg/ day along with cholesterol 25 mg/kg/day in oil, group IV and V were test groups received alcoholic extract of *Tagetes erecta* whole plant (METE) at dose of 200 and 400 mg/kg/day along with cholesterol 25 mg/kg/day in oil. The animals were treated for 30 days in above stated regimen. After 30 days, the blood samples were drawn from the tail vein with the

help tuberculin syringe after a fast of 12 hrs and the blood was centrifuged (2,500 rpm/10min) to get serum.

Estimation of parameters

The serum so collected was used for estimation of serum cholesterol, serum triglyceride, serum HDL, serum LDL. Triglycerides were estimated by analytical kit supplied by Span Diagnostics [7], Cholesterol by Chod-Pod / Phosphotungstate Method [8], high density lipoprotein (HDL) and low density lipoprotein (LDL) concentrations were determined by methods reported earlier [9, 10].

Statistical analysis

The results are expressed as Mean ± SEM. Statistical analysis was performed by one-way analysis of variance (ANOVA) test for multiple comparison followed by Turkey- Karmer test. Statistical significance was set accordingly.

RESULTS AND DISCUSSION

Acute oral toxicity studies

In acute toxicity study there was no behavioral changes up to 4 hours and no mortality was observed up to the end of 48 hours and from this a dose of 200 and 400 mg/kg body weight was taken for the present study.

Effect of *Tagetes erecta* on serum triglyceride levels

Group – II animals receiving cholesterol showed a significant increase in triglyceride levels when compared to the normal group (G – I). Rats treated with standard drug (G – III) had significantly lowered triglyceride level when compared to the cholesterol treated group (G – II). A significant decrease in serum triglycerides was observed in animals treated with *Tagetes erecta* extract at 400 mg/kg dose (G – V), when compared to the cholesterol treated group (G – II) where as 200 mg/kg was shown a slight action which was not that much effective.

Effect of *Tagetes erecta* on serum cholesterol

The biochemical parameter, serum cholesterol has shown significant increase in cholesterol treated group (G – II) when compared with the normal group (G – I). A significant decrease in the levels of serum cholesterol was observed on administration of Lovastatin (G – III), when compared with the cholesterol treated group (G – II). *The Tagetes erecta* extract at 400 mg/kg (G – V) caused a significant decrease in the serum cholesterol when compared to the cholesterol treated group (G – II).

Effects of *Tagetes erecta* on serum HDL level

The rats induced with cholesterol (G – II) shown a significant decrease in HDL levels was observed, when compared to the normal group (G – I). Group – III, receiving standard drug Lovastatin showed a significant increase in HDL levels when compared to the control group (G – II). Administration of *Tagetes erecta* extract at 400 mg/kg (G – V) have shown a significant increase in HDL levels when compared to the control group (G – II), however there was no marked effect of *Tagetes erecta* extract at 200 mg/kg.

Effect of *Tagetes erecta* on serum LDL level

The rats induced with cholesterol (G – II) a significant increase in LDL levels was observed when compared to the normal group (G – I). Group – III, receiving standard drug showed a significant decrease in LDL levels when compared to the control group (G – II). Administration

of *Tagetes erecta* extract at dose of 400 mg/kg (G – V) has shown a significant decrease in LDL levels when compared to the control group (G – II) and there was no marked effect of *Tagetes erecta* extract at 200 mg/kg.

Tables and figures

Tab. No.1 Effects of *Tagetes erecta* on serum lipid profiles in hyperlipidemic rats

Treatment	Serum lipid profile			
	Triglycerides (mg/dL)	Cholesterol (mg/dL)	HDL (mg/dL)	LDL (mg/dL)
Control	159.8±15.48	61.2±6.45	51.3±5.54	53.93±6.45
Cholesterol 10 mg/kg/day	244.3±17.23[b]	159.2±16.2[a]	31.23±3.58[b]	118.2±11.4[a]
Lovastatin 10 mg/kg/day	155.3±16.47[d]	80.5±5.0[b]	57.63±8.85[d]	60.5±5.35[c]
T. erecta 200 mg/kg/day	178.8±13.6[c]	97±9.28[b]	61.63±19.2[d]	81.2±5.25[c]
T. erecta 400 mg/kg/day	169.4±14.2[d]	89.2±8.56[c]	78.3±6.64[c]	71.2±6.45[d]

a = p < 0.01, when compared to normal (Group – I)
b = p < 0.001, when compared to normal (Group – I)
c = p < 0.05, when compared to control (Group – II)
d = p < 0.01, when compared to control (Group – II)

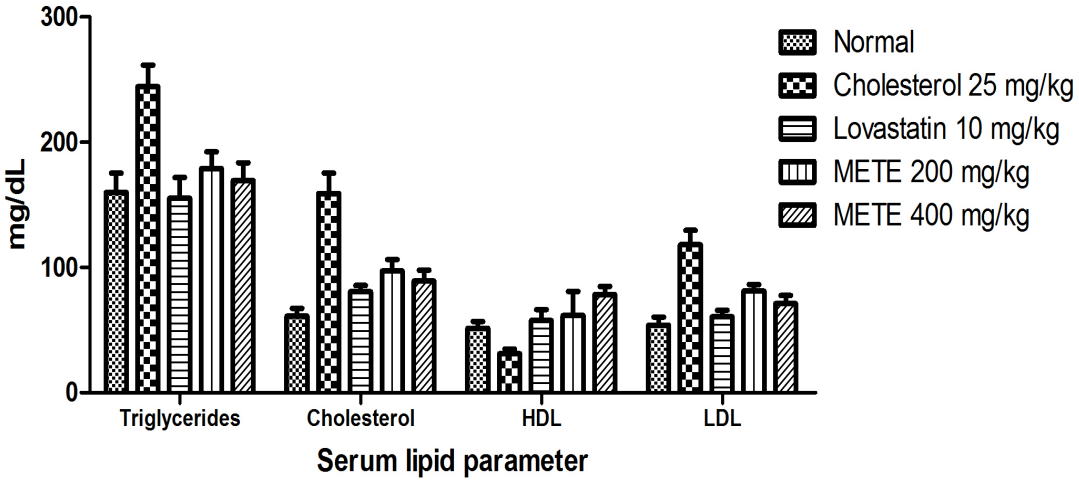

Figure No. 1 Effect of *Tagetes erecta* on serum lipid profiles in hyperlipidemic rats

CONCLUSION

The marked hyperlipidemia that characterizes is regarded as a consequence of the uninhibited actions of lipolytic hormones (glucagons and catecholamines) on the fat depots. On the other hand, increased LDL – Cholesterol may arise from glycosylation of the lysyl residues of apoprotein B [11]. The ability of LDL – cholesterol to form lipid peroxides was found to be specifically responsible for the atherogenesis. It is reported that a deficiency in lipoprotein lipase activity may contribute to significant elevation of triglycerides in blood and with insulin administration; lipoprotein lipase activity is elevated and leads to lowering of plasma triglyceride concentrations [12]. Administration of *Tagetes erecta* almost reversed these effects as it reduced total cholesterol and triglyceride concentrations (plasma), LDL concentration and increased HDL notably in combination. In this context, *Tagetes erecta* was found to be as significantly effective as Lovastatin in reducing the plasma lipid profiles in cholesterol fed rats. However comprehensive phytochemical and pharmacological and pharmacological screening is required to find out the exact phytoconstituent and mechanism by whose presence, *Tagetes erecta* is showing this potent activity.

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