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## ANTI-HYPERLIPIDEMIC ACTIVITY OF *TAMARIX GALLICA* EXTRACTS IN TRITON X-100 INDUCED HYPERLIPIDEMIC RATS

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### Abstract

Hyperlipidemia is the greatest risk factor of coronary heart disease. The present study was designed to investigate the antihyperlipidemic activity of METG (Methanolic Extract of *Tamarix Gallica*.) and PETG (Phenolic Extract of *Tamarix Gallica*) in Triton X-100 induced Hyperlipidemic rats. METG was administered at dose of 500mg/kg. PETG was administered at a dose of 400, and 500 mg/kg, to Triton induced Hyperlipidemic rats for 7 days to study Antihyperlipidemic Activity. Atorvastatin is used as reference standard. The statistical analyses were carried out using one way ANOVA followed by dunnet t-test. The Standard group (i.e Atorvastatin group) significantly lowers the serum lipid level ( $P < 0.001$ ). The results of the study indicate that METG Extract and PETG Extract at a dose of 500 mg/kg & 400 mg/kg significantly lowered serum lipid levels ( $P < 0.01$ ). PETG Extract at a dose of 500 mg/kg significantly lowered serum lipid levels, ( $P < 0.001$ ) PETG Extracts showed a dose dependant decrease in the levels of cholesterol, Triglyceride, LDL-C and VLDL-C level and increase in HDL-C. PETG 500mg/kg reduced the elevated lipid levels more significantly than the other Groups. ( $P < 0.001$ ) against triton induced hyperlipidemic rats. Therefore it effectively suppressed the Triton induced hyperlipidemia in rats.

**Keywords:** METG, PETG, Hyperlipidemia, Triton X-100.

### 1. Introduction

Hyperlipidemia is a major cause of Atherosclerosis and Atherosclerosis associated conditions such as coronary Heart disease, Ischemic cerebrovascular disease and peripheral vascular disease<sup>1</sup>. Numerous population studies have linked an

elevated concentration of total cholesterol (TC), low density lipoprotein – cholesterol (LDL-C) and very density lipoprotein – cholesterol (VLDL-C), in plasma with an increased incidence of atherosclerotic events.<sup>2,3</sup>. Atherosclerosis is a progressive disease characterized by lipid accumulation and fibrous elements in Arteries that are responsible for the onset of cardio vascular disease<sup>4</sup>. Cardio vascular disease are leading cause of death in both Industrialized and developing Nations<sup>5</sup>. Therefore it is very important to pay attention to early stage prevention and control of Hyperlipidemia in a comprehensive way<sup>6</sup>. Reduction in serum cholesterol level reduces the risk for coronary heart disease (CHD)<sup>7</sup>. The main aim of treatment of patients with hyperlipidemia is to reduce the risk of developing ischemic heart disease or the occurrence of further cardiovascular or cerebrovascular disease<sup>8</sup>. Currently available hypolipidemic drugs have been associated with Number of side effect<sup>9</sup>. The consumption of Synthetic drugs leads to hyperuricemia, diarrhoea, nausea, myositis Gastric irritation flusing, dry skin and abnormal liver function<sup>10</sup>. An herbal treatment for hyper cholesterolemia has almost no side effects and is relatively cheap, locally available. They are effective in reducing the lipid level in the system<sup>11</sup>. Medicinal plants play a major role in Antihyperlipidemic Activity<sup>10</sup>.

*Tamarix Gallica* is commonly known as Jhau, or Jhav, Jhavuka, English : Tamarisk or salt cedar, Telugu : Etusarumanli and in Arabic : Fersing. It was first described for botanical classification by the Taxonomist Carotes Linnaceus in 1753, but had already in cultivation since 1596<sup>12</sup>. These deciduous herbaceous, twiggy shrub or small tree reaching upto about 5 meters high are indigenous to Saudi Arabia and are very common around the Mediterranean region. Its Native range the plant grows in moist area such as river bank especially in saline soils<sup>13</sup>. It also found in Abundance in North India<sup>14</sup>. It is present in many other areas. As an invasive introduced special, often becoming anoxious weeds<sup>15</sup>: it has fragile, woody branchlets that drop off in autumn along with the small, scale-like leaves that cover them. The leaf shape is an adaption over time to exceedingly dey conditions the pink flowers are tiny, hermaphroditic, and are borne on narrow, feather like spikes. They frequently bloom earlier than the leaves first in may and sometimes a second time in August. The plant is mainly found in the salty regions and is found between interdunal aread of the desert<sup>16</sup>. Manna is produced by the plant in response to insect damage to the stem. It is sweet and mucilaginous. There is some confusion over whether the manna is produced by the plant (or) whether it is an exudoleon from the Insect<sup>17</sup>. The principle constituent in the plant is Tamarexin along with polyphenolic compounds such as flavonoids, phenolic acids, tannins and coumarins<sup>18,19</sup>. *Tamarix Gallica* is employed in traditional medicines as

Astringent, apeticif, Stimulus of perspiration and diuretic<sup>18</sup>. The branchlets and the leaves are Astringent and diveretic<sup>20</sup>.The plants have been reported to be useful in leucoderma, Spleen trouble and eye disease<sup>21</sup>. It posses Anti inflammatory and Analgesic effect corparable to the of NSAID'S<sup>22</sup>. The fresh leaves are used Rheumatic pain<sup>13</sup>.It is used as an Anthelmintic, antihaenorrhoid, haemostat and for diarrhoea and gingivitis. The plant is used to cure dromedary galls<sup>23</sup>. Leaf and flowers extract and their phenolic compounds (isoquercitin catechin) show Antioxident and Antimicrobial Activity<sup>24</sup>. It can also be used as prophylactic and therapeutic remedies to cure malaria as folk Medicine<sup>25</sup>. It also has hepatotonic and stimulant properties traditionally used in the treatment of various liver diseases. The 50% Methanolic extract of Tamarix Gallica leaves showed evidence of Antihepatotoxic Activity in the mice<sup>26</sup>. Methonotic extract of Tamarix Gallica Isothiocyanates of Tanarix Gallica have been Shown to be especially effective in fighting lung and Esophageal cancer<sup>27</sup>. The extract of *Tamarix gallica* is very rich in acid compounds that are used as an inhibitor of nephrolithiasis (calcium oxalate)<sup>28</sup>.*Tamarix Gallica* has found in many commerical medicines like Liv 52, Digyton, geriforte Aqua vet, Liv 52 vet, Liv 52 DS.<sup>29</sup>

## 2. Materials and Methods

### Collection and Authentification of Plant Material:

The Aerial Parts of *Tamarix gallica* for the study were procured from Nirankar Herbs, C-10/33, Sec-5, Rohini 85 Delhi (India). Dated.13/03/2013.The authentication of leaves was done by Dr.T.Ugandhar, Dept.of Botany, S.R.R. Govt. Degree College. Karimnagar. Andhra Pradesh.

**Extraction of Plant Material:** The plant is grinded in to a coarse powder with the help of suitable grinder.

### Cold Extraction (Methanol Extraction):<sup>30</sup>

In this work the cold extraction process with the help of methanol has been used. About 200gms of powdered material was taken in a clean, flat bottomed glass container and soaked in 750 ml of methanol. The container with its contents were sealed and kept for period of 7 days accompanied by continuous shaking with the shaker. The whole mixture then went under a coarse filtration by a piece of a clean, white cotton wool.

### Evaporation of Solvent:

The filtrates (methanol extract) obtained were evaporated under ceiling fan in to a stainless steel tray until they had dried .They rendered a gummy concentrate of greenish black. The extract was kept in vaccum dissector for 7 days.

**% yield value of methanol extract from whole aerial parts of *Tamarix Gallica* plant.**

Powder taken for extraction = 200gm Weight of the empty china dish = 53.70gm

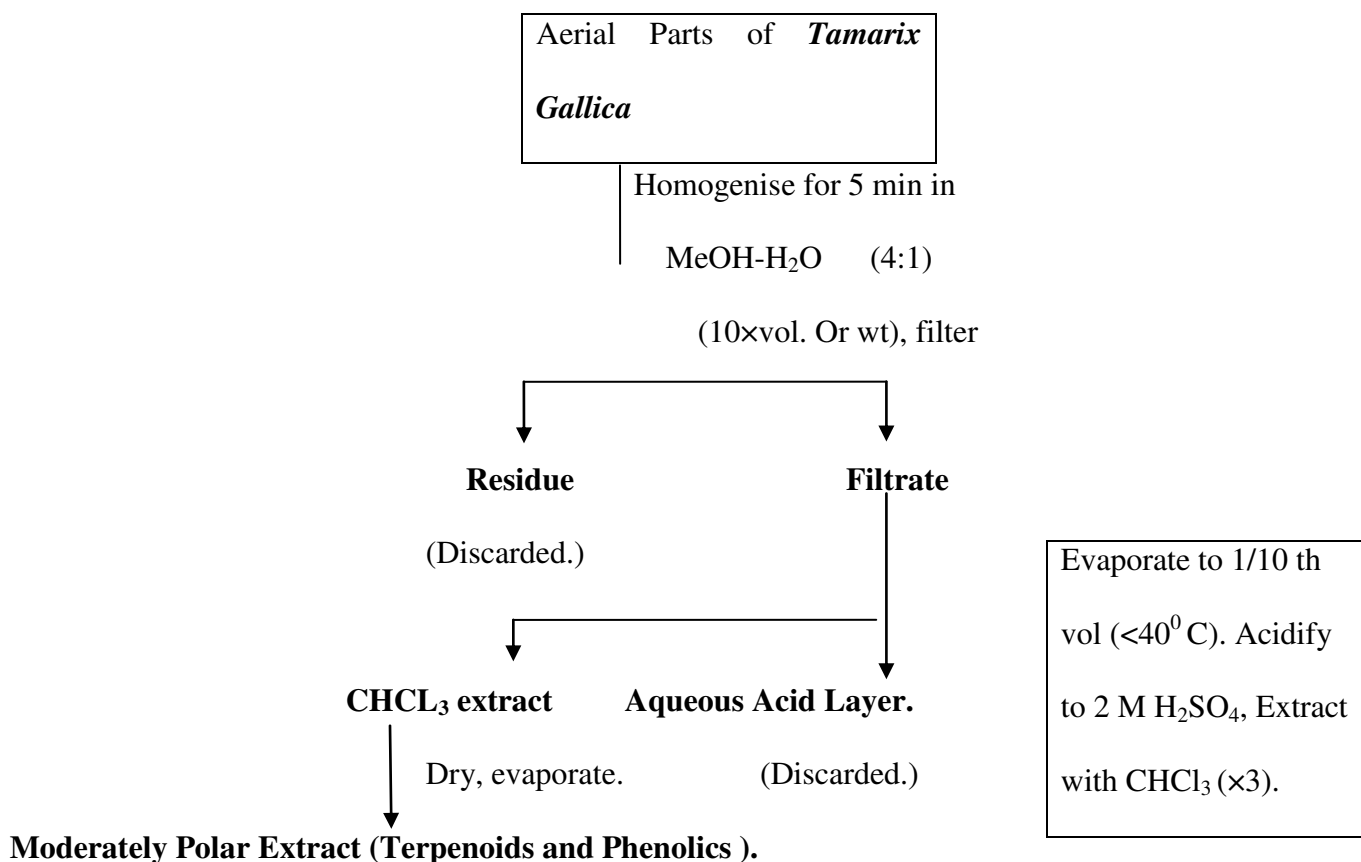
Weight of the china dish with extract = 73.24gm

Weight of the extract obtained = (73.24-53.70) gm = 18.54 gm

% yield of methanol extract = (weight of extract)/(powder taken for extraction ) × 100

$$= 18.54/200 \times 100 = 9.27 \%$$

**Phenolic Constituents Extracts <sup>31</sup>:**



**% Yield value of Phenolic extract from Aerial Part of *Tamarix Gallica* plant .**

Powder taken for extraction = 750gm

Weight of the empty china dish = 67.24gm

Weight of the china dish with extract = 82.39gm

Weight of the extract obtained = (82.39 -67.24) gm = 15.2 gm

% yield of methanol extract = (weight of extract)/(powder taken for extraction ) × 100

$$= 15.2/750 \times 100 = 2.0 \%$$

### **Preliminary Phytochemical Screening:**

The METG and PETG extract obtained was analysed for the presence of Alkaloids, Tannins, Flavanoids, Saponins, Steroids, by using standard procedure for analysis<sup>32</sup>

### **Chemicals**

Triton x-100 was purchased from Unisource Mumbai India, cholesterol kits triglycerides and hdl-c were purchased from Excel Diagnostics Pvt, Ltd, India Atorvastatin was purchased from Dr.Reddy Lab's, Hyd. All solvents used for extraction procured from Molychem, Mumbai and Finar Ltd, Ahmedabad, India

### **Experimental Animals:**

Healthy Adult Male wistar rats (Mahaveer Enterprises, Hyd, India) of 8-10 weeks old with Average weight in the range of 150-180gms were selected. Animals are housed 4 per cage in temperature controlled ( $27^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ) room with light/dark cycle in a ratio of 12:12 hrs is to be maintained. The Animals are allowed to acclimatize to the environment for seven days and are supplied with a standard diet and water *ad libitum*. The guidelines of committee for the purpose of control and supervision of experiments on Animals. (CPCSEA), Govt of India were followed and prior permission was sought from the Institutional Animal Ethics Committee (IAEC) for conducting the study.

### **Acute Toxicity Studies<sup>33</sup> :**

The Acute Toxicity Studies was performed using female rats as per OECD Guideline No.425 (Short term toxicity). Female Albino rats were administered graded doses from (50-5000mg/kg body weight ). After the administration of extracts the rats were observed for 48hrs. The toxicological effect were observed in terms of mortality expressed as LD50. the number of animals dying during a period was noted.

### **Anti - Hyperlipidemic Activity.**

The systemic administration of the surfactant Triton X-100 to rats results in a biphasic elevation of plasma cholesterol and triglycerides. Hyperlipidemia was induced in Wistar albino rats by single intraperitoneal injection of freshly prepared solution of Triton-X-100 (100 mg/kg) in physiological saline solution after overnight fasting for 18 h.<sup>13</sup>

The rats were divided in to six groups containing four animals in each group.

Group – I : Normal Control.

Group –II: Hyperlipidemic control (Triton x 100.)

Group – III : Hyperlipedemic rats treated with METG at dose of 500mg/kg.

Group – IV : Hyperlipedemic rats treated with PETG ( Low Dose) at dose of 400mg/kg.

Group – V : Hyperlipedemic rats treated with PETG (High Dose) at dose of 500mg/kg.

Group – VI : Hyperlipedemic rats treated with Atorvostatin (Standard drug) at 10 mg /kg .

### **All the groups' recives**

Single i.p. injection of Triton X-100 at dose of 100mg/kg, simultaneously with Group- II, Group – III, Group – IV, Group – V, Group – VI , except Group – I (Normal control). After 72 hours of Triton X-100 injection. The Group – VI receives atorvostatin at dose of 10 mg/kg, was prepared by suspending bulk atrovastatin in aqueous 0.5% methyl cellulose<sup>34</sup> for 7 days. The Group– III, receive *Tamarix gallica* METG, at a dose of 500mg/kg for 7 days and Group – IV, Group – V recives PETG at a dose of 400mg/kg and 500mg/kg for 7 days.

### **Blood Sample Collection and Analysis:**

The rats are Anestheticed by ether and then Blood samples were collected at 0, 24, 48, and 72 hours of triton x-100 injection and on 8<sup>th</sup> day<sup>13</sup> from retro-orbital plexus of rat using micro capillary technique from rats of all the groups<sup>35</sup>, and centrifuged at 2500 rpm for 15 min so as to get serum. Serum is used for estimating lipid profiles. All samples were stored at 4°C until analysis.

### **Bio-Chemical Analysis:**

The serum is analyzed for total cholesterol, triglycerides and HDL levels using biochemical kits (diagnostic kit.)<sup>36</sup>. VLDL, and LDL- Cholesterol were calculated by the below formula. Serum LDL- Cholesterol concentration was calculated According to the equation of Fried and wald<sup>37</sup>.

$$\text{LDL-Cholesterol} = \text{Total Cholesterol} - (\text{HDL- Cholesterol} + \text{TG}/5) ; \text{VLDL-C} = \text{TG}/5$$

### **Statistical Analysis:**

Results are expressed as mean ± S.D .all the results were compared with control subject one-way analysis of variance (ANOVA), followed by the t-test using Graph Pad PRISM Software 6 version. P Values < 0.05 were as considered statistically significant.

**Results:**

**Preliminary Phytochemical Screening:** Phytochemical investigation revealed the presence of Alkaloids, Tannins, Flavanoids, Saponins, Phenols in Methanolic (METG) extracts while only Phenolic ( flavonoids ) were present in Phenolic (PETG) Extracts.

**Table.no:2 Phytochemical Screening.**

Phytochemical	Results
Steroid	-
Alkaloid	+
Tannin	+
Carbohydrate	-
Phenol	+
Flavonoid	+
Saponin	+

(+) Present in *Tamarix Gallica*.

(-) Absent in *Tamarix Gallica*

**Acute Toxicity Studies**

As per (OECD) draft guidelines 425 received from CPCSEA, young female albino rats were given 50-5000 mg/kg b.w. of *Tamarix Gallica* extract for the purpose of toxicity study. Animals were observed at regular time intervals at least once during the first 30 min of initial dosing and kept in observation for 48 hrs. In all the cases, no death was observed. Additional observations like behavioral changes in skin, fur, eyes, mucous membranes, respiratory, circulatory, motor activity and behavior pattern were also found to be normal. Attention was also given to observation of tremors and convulsions. Overall results suggested the LD<sub>50</sub> value as 3000 mg/kg. Hence therapeutic dose was calculated as 1/5<sup>th</sup> and 1/10<sup>th</sup> (i.e. 400mg/kg and 500 mg/kg of the lethal dose for the purpose of antihyperlipidemic investigations.

Sl.No	GROUPS	TC	TG	HDL	LDL	VLDL
I	Normal Control	64.03 ± 1.45	82.66 ± 2.46	38.91 ± 2.33	8.45 ± 3.43	16.53 ± 0.49
II	Hyperlipidemic Control	192.47 ± 5.05*	168.9±5.28*	21.86±2.74*	136.82±7.00*	33.79±1.05**
III	METG 500mg/kg	134.19 ± 3.5*	117.57 ± 5.25*	27.1 ± 2.99***	83.58 ± 5.26*	23.51 ± 1.05***
IV	PETG(Low Dose ) 400mg/kg.	121.74 ± 7.74*	107.93 ± 6.67*	31.04 ± 4.32**	69.11 ± 10.51***	21.58 ± 1.33***
V	PETG (High Dose) 500mg/kg.	112.97 ± 5.25*	103.55 ± 4.2*	33.15 ± 2.51**	59.1 ± 6.89*	20.71 ± 0.84***
VI	Standard Atorvastatin10mg/kg	92.29 ± 5.63*	102.26 ± 7.68*	39.18 ± 3.14**	32.91 ± 7.61*	20.44 ± 1.53**

All the data are expressed as MEAN ± S.D (n=4), \*P = < 0.001, \*\*P = < 0.01, \*\*\*P = < 0.05. vs GROUP .II.

TC: Total Cholesterol ; TG: Triglycerides ; HDL-C : High Density Lipoprotein cholesterol ; LDL-C : Low Density Lipoprotein- cholesterol ; VLDL-C : Very Low Density Lipoprotein ; METG: Methanolic Extract of *Tamarix Gallica*.; PETG: Phenolic Extract of *Tamarix Gallica*.

Table.No: 4. Comparison of 0<sup>th</sup> day and 8<sup>th</sup> day.

Sl.NO	GROUPS	TC		TG		HDL-C		LDL-C		VLDL-C	
		0 <sup>th</sup> Day	8 <sup>th</sup> Day	0 <sup>th</sup> Day	8 <sup>th</sup> Day	0 <sup>th</sup> Day	8 <sup>TH</sup> Day	0 <sup>th</sup> Day	8 <sup>th</sup> Day	0 <sup>th</sup> Day	8 <sup>th</sup> Day
I	NORMAL CONTROL	64.03	-----	82.66	-----	38.91	-----	8.45	-----	16.53	-----
II	HYPERLIPIDEMIC CONTROL	192.47	-----	168.98	-----	21.86	-----	136.82	-----	33.79	-----
III	METG 500 mg/kg.	175.28	134.19 (23.44%)	136.43	117.57 (13.82%)	25.3	27.1 (-7.11%)	122.7	83.58 (31.88%)	27.28	23.51 (13.81%)
IV	PETG (Low Dose) 400 mg/kg.	180.97	121.74 (32.72%)	138.46	107.93 (22.04%)	20.98	31.04 (-47.9%)	132.3	69.11 (47.76%)	27.69	21.58 (22.06%)
V	PETG (High Dose.) 500mg/kg	187.86	112.97 (39.86%)	144.8	103.55 (28.48%)	19.01	33.15 (-74.38%)	139.8	59.1 (57.72%)	28.97	20.71 (28.51%)
VI	Standard 10mg/kg ATORVASTATIN	180.79	92.29 (48.95%)	148.78	102.26 (31.26%)	20.5	39.18 (-91.12%)	130.52	32.91 (74.78%)	29.75	20.44 (31.29%)

Table.no.5: %Reduction of TC,TG, LDL-C, VLDL-C in Group-III to Group-VI.

GROUPS	TC %	TG %	LDL-C %	VLDL-C %
GROUP-3	23.44	13.82	31.88	13.81
GROUP-4	32.72	22.04	47.76	22.06
GROUP-5	39.86	28.48	57.72	28.51
GROUP6	48.95	31.26	74.78	31.29

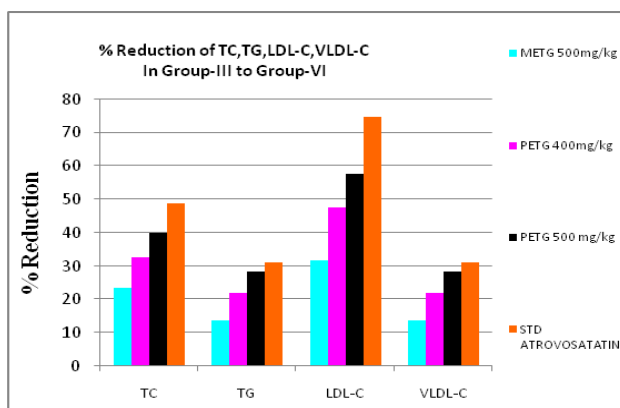
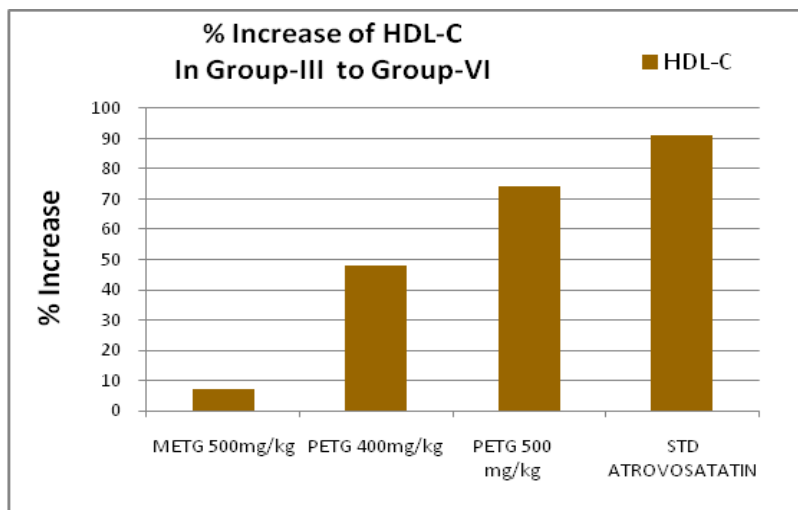


Fig.no:5 %Reduction of TC, TG, LDL, VLDL in Group III to Group-VI.



**Table.no.6: % Increase of HDL-C in Group-III to Group-VI.**

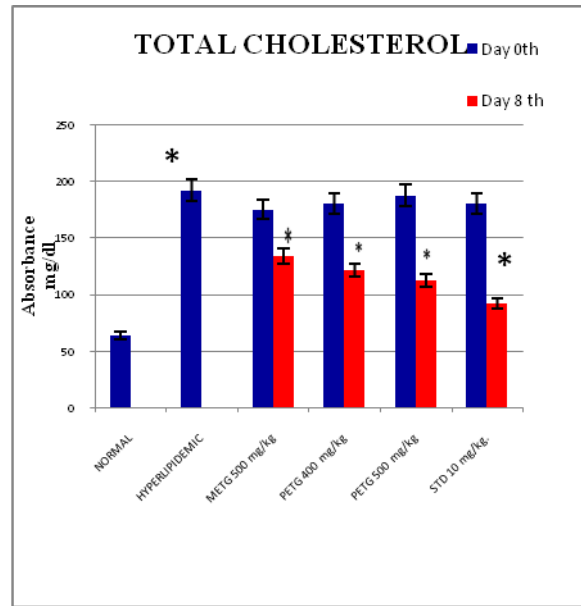
(-) Indicates Increase in HDL-C



GROUPS	HDL-C
METG 500mg/kg	-7.11
PETG 400mg/kg	-47.9
PETG 500 mg/kg	-74.38
STD 10mg/kg ATROVOSATATIN	-91.12

**Effect of *Tamarix gallica* Extracts on Serum Total Cholesterol levels.**

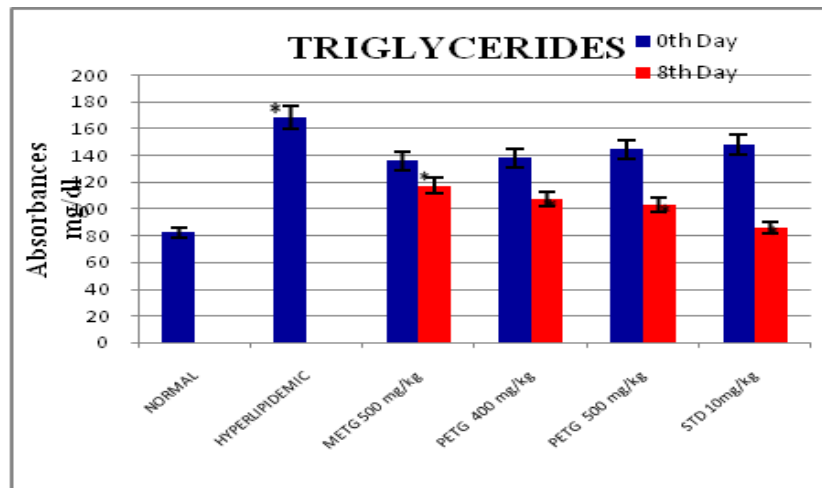
In the Normal rats the Total Cholesterol levels were to found be  $64.03 \pm 1.45$  on 0<sup>th</sup> day respectively. Treatment with Triton-X-100 caused a significant rise in the levels of Total Cholesterol in Group- II, to Group-VI and the levels were found to be  $192.47 \pm 5.05$ ,  $175.28 \pm 4.43$ ,  $180.97 \pm 5.21$ ,  $187.86 \pm 9.66$ , and  $180.79 \pm 9.1$ , respectively. Administration of various doses of the METG & PETG after the treatment with Titon-X-100 resulted in the decreasing of Cholesterol levels. The total cholesterol levels of groups treated with METG at dose of 500mg/kg were  $134.19 \pm 3.5$ , and group treated with PETG at dose of 400mg/kg & 500mg/kg were  $121.74 \pm 7.74$  and  $112.97 \pm 5.25$  respectively, and lowering of cholesterol was dose dependent manner in PETG. In Standard (Atorvastatin) group the total cholesterol was reduced to  $92.29 \pm 5.63$ .



**Fig.no:7 Effect of *Tamarix gallica* Extracts on Serum Total Cholesterol levels.**

**Effect of *Tamarix gallica* extracts on Serum Triglyceride levels.**

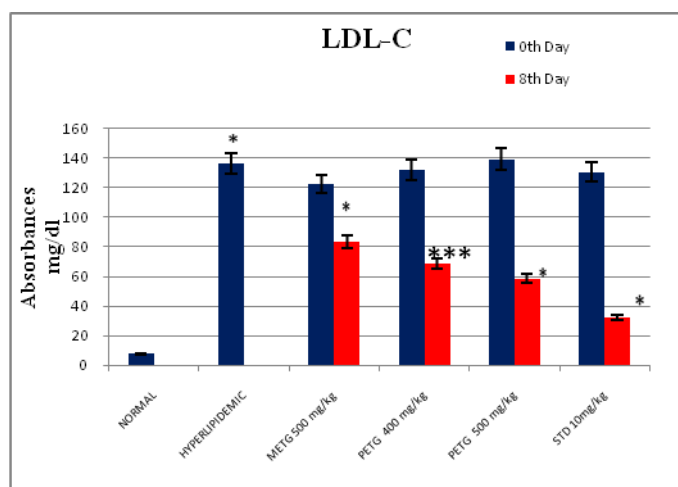
In the Normal rats the Triglycerides levels were to found be  $82.66 \pm 2.46$  on 0<sup>th</sup> day respectively. Induction of hyperlipidemia resulted in significantly raised in Triglyceride levels in Group-II to Group- VI, and the levels were found to be  $168.9 \pm 5.28$ ,  $136.43 \pm 7.74$ ,  $138.46 \pm 1.61$ ,  $144.11 \pm 7.12$ , and  $148.78 \pm 10.23$ , respectively. The triglyceride values of hyperlipidemic rats treated with METG at dose of 500mg/kg were found to be  $117.57 \pm 5.25$  and PETG at dose of 400mg/kg and 500mg/kg were  $107.93 \pm 6.67$  and  $103.55 \pm 4.2$ . Administration of various doses of the PETG was able to produce a dose dependant decrease in the triglyceride levels and lowering of triglycerides was dose dependent manner in PETG. In Standard ( Atorvastatin ) group the triglycerides was reduced to  $102.26 \pm 7.68$ .



**Fig.no:8 Effect of *Tamarix gallica* Extracts on Serum Triglycerides levels.**

**Effect of *Tamarix gallica* Extracts on Serum LDL-C levels.**

In the Normal rats the LDL-C levels were to found be  $8.45 \pm 3.43$  on 0<sup>th</sup> day respectively. Treatment with Triton-X-100 caused a significant rise in the levels of LDL-C in Group-II, to Group- VI , and the levels were found to be  $136.82 \pm 7.00$ ,  $122.7 \pm 10.93$ ,  $132.3 \pm 5.05$ ,  $139.8 \pm 3.44$ ,  $130.52 \pm 7.98$ . Administration of various doses of the METG & PETG after the treatment with Titon-X-100 resulted in the decreasing of LDL-C levels. The LDL-C levels of groups treated with METG at dose of 500mg/kg were  $83.58 \pm 5.26$  , and Groups treated with PETG at dose of 400mg/kg & 500mg/kg were  $69.11 \pm 10.51$  and  $59.1 \pm 6.89$  respectively. and lowering of ldl-c was dose dependent manner in PETG. In Standard ( Atorvastatin ) group the ldl-c was reduced to  $32.91 \pm 7.61$ . The reduction in LDL-C level by METG and PETG was significant at ( $p < 0.01$ ).



**Fig.no:9 Effect of *Tamarix gallica* Extracts on Serum LDL-C levels.**

**Effect of *Tamarix gallica* Extracts on Serum VLDL-C levels.**

The VLDL-C levels in Normal rats at 0<sup>th</sup> were found to be  $16.5 \pm 0.5$ . Administration of Triton-X-100 resulted in a rise in VLDL-C levels. Treatment with Triton-X-100 caused a significant rise in the levels of VLDL-C in Group-II, to Group- VI , and the levels were found to be  $33.79 \pm 1.05$ ,  $27.28 \pm 1.54$ ,  $27.69 \pm 0.32$ ,  $28.97 \pm 1.42$ ,  $29.75 \pm 2.05$ . Administration of various doses of the METG & PETG after the treatment with Titon-X-100 resulted in the decreasing of vldl-c levels. The vldl-c levels of groups treated with METG at dose of 500mg/kg were  $23.51 \pm 1.05$ , and group treated with PETG at dose of 400mg/kg & 500mg/kg were  $21.58 \pm 1.33$  and  $20.71 \pm 0.84$  respectively. and lowering of vldl-c was dose dependent manner in PETG. In Standard ( Atorvastatin ) group the vldl-c was reduced to  $20.44 \pm 1.53$ . The reduction in cholesterol level by METG and PETG was significant at ( $p < 0.05$ ).

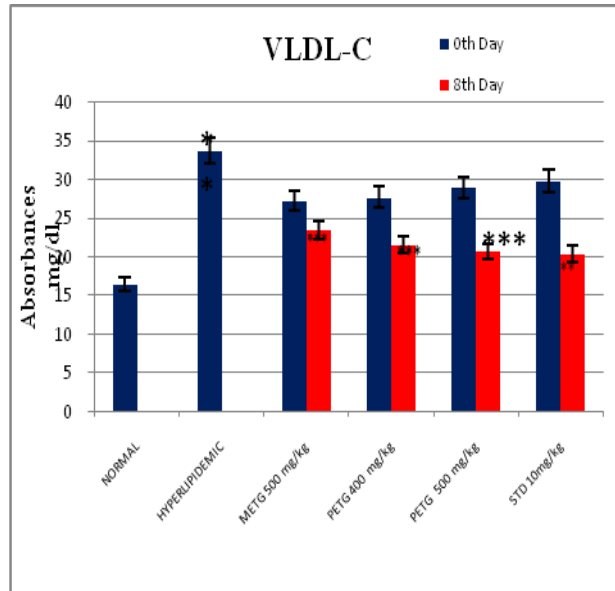


Fig.no:10 Effect of *Tamarix gallica* Extracts on Serum VLDL-C levels.

**Effect of *Tamarix gallica* on Serum HDL-C levels.**

The HDL-C levels in normal rats at 0<sup>th</sup> were found to be  $38.91 \pm 2.33$ . Treatment with Triton-X-100 caused a significant fall in the levels of HDL-C in Group-II, to Group- VI, and the levels were found to be  $21.86 \pm 2.74$ ,  $25.3 \pm 4.94$ ,  $20.98 \pm 0.48$ ,  $19.01 \pm 4.29$  and  $20.53 \pm 0.93$ . Where as groups treated with METG at dose of 500mg/kg was  $27.1 \pm 2.99$  and groups treated with PETG at dose of 400mg/kg and 500mg/kg showed a dose dependant increase in the HDL-C levels. ( $31.04 \pm 4.32$  and  $33.15 \pm 2.51$  respectively). In Atorvastatin group the HDL-C was elevated to  $39.18 \pm 3.14$ .

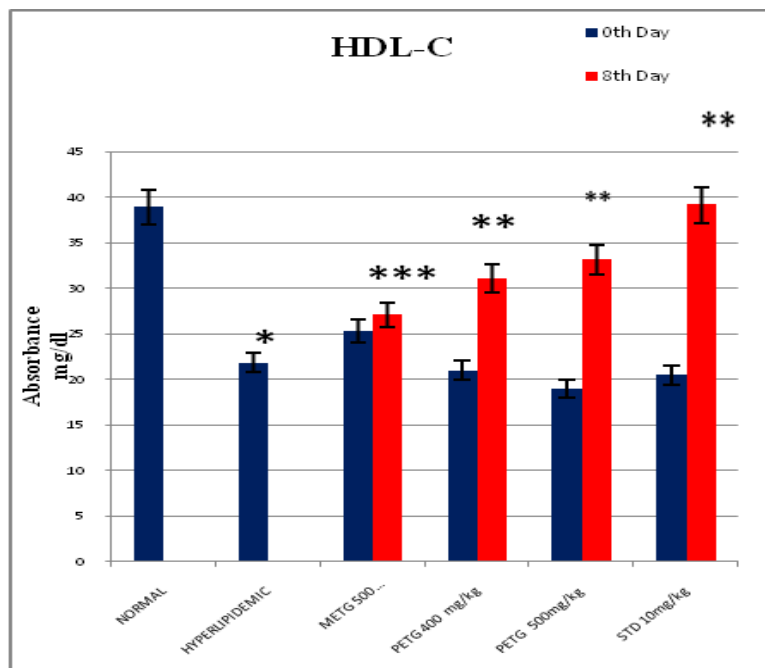


Fig.no.11 Effect of *Tamarix gallica* on Serum HDL-C levels.

## Discussion

The present study was designed to investigate the antihyperlipidemic activity of *Tamarix gallica* extract in Triton X-100 induced hyperlipidemic rats. Administration of Triton-X-100 (100mg/kg) to all the fasted rats caused an elevation of Total Cholesterol, Triglycerides, VLDL and LDL and reduction in HDL levels. After 72 hrs of induction of Triton X-100 results in hyperlipidemia which is compared with normal control group .which results in significantly increased serum lipid levels in hyperlipidemic group ( P <0.001) The change in lipid levels in group number III to VI, were comparable with group of Hyperlipidemic control ( i.e Triton X-100 ,Group- II) . The Standard group (i.e Atorvastatin group) significantly lowers the serum lipid level (P<0.001). The results of the study clearly indicate that METG Extract and PETG Extract at a dose of 500 mg/kg & 400 mg/kg significantly lowered serum lipid levels (P<0.01). PETG Extract at a dose of 500 mg/kg significantly lowered serum lipid levels, (P<0.001) i.e. antihyperlipidemic activity which was found to be more effective in higher dose of PETG as compared to METG and lower dose of PETG when administered orally in triton induced hyperlipidemic models. METG Extract having very low hypolipidemic activity. PETG Extracts showed a dose dependant decrease in the levels of cholesterol, Triglyceride, LDL-C and VLDL-C level and increase in HDL-C Levels . Among three groups (i.e. group number III-V), Group number- V reduced the elevated lipid levels more significantly than the other Groups.(P<0.001) Flavonoids have exhibited a variety of pharmacological activities, including the antiatherogenesis and antioxidant effect<sup>38</sup> . Thus the present result strongly suggests that the hypolipidemic activity of this medicinal plant could be attributed to the presence of Tannis, Phenols, Flavonoids. in the Extracts.

## Conclusion

The results concluded that PETG (500 mg/kg) have definite antihyperlipidemic activity in Triton X-100 induced hyperlipidemic model and which is equipotent activity when compared with Atorvastatin treated groups. Further studies on this extract may lead to identify the possible mechanism of action and isolation of active principle from the same.

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