

ANTI HYPERLIPIDEMIC ACTIVITY OF MACROTYLOMA UNIFLORUM LINN

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ABSTRACT

Hyperlipidemic is the one of the risk factor responsible for atherosclerosis, and cardiovascular diseases. The aim of present work is to screen the antihyperlipidemic activity of *Macrotyloma uniflorum* Linn leaves extract in cholesterol diet induced hyperlipidemic rats. Wister albino rats were divided into 5 groups and were treated with (control) normal rats without cholesterol diet, (toxic control) cholesterol diet only, (standard) cholesterol diet + Atrovastatin (10mg/kg) b.w, (Test group-1) pet ether extract treated group+ cholesterol diet (Test group-2) chloroform extract + cholesterol diet, (Test group-3) ethanol extract + cholesterol diet. Respectively for 20 days. Data expressed as mean \pm S.E.M and analyzed statistically using ANOVA followed by Dunnet's 'T' test and compare with respective control group. Chloroform extract treated group at a dose of 100mg/kg b.w has reduced significantly Total cholesterol, Triglycerides, Low density lipoprotein, Very low density lipoprotein and consecutively increased the level of High density lipoproteins. Ethanolic extract group has shown moderate significant action, whereas petroleum ether extract group has shown very low significant action. It can be concluded that the constituents like alkaloids, flavonoids which are present in chloroform extract of *Macrotyloma uniflorum* may be responsible for the activity.

KEYWORDS: High density cholesterol level, Low density cholesterol level, Very low density cholesterol level, *Macrotyloma uniflorum* Linn.

INTRODUCTION

For centuries, the plant kingdom has been one of the largest areas from which novel medicines are derived. The constituents of plants often have medicinal and research value, such as for treating diseases^[1] and understanding basic natural science. Many recent studies have focused on plant extracts in order to find new chemicals that could be beneficial to mankind.^[2] *Macrotyloma uniflorum* is popularly known as Horse gram belongs to the family Fabaceae. Traditionally, it has been widely used in the treatment of kidney stones, inflamed joints, fever, sinus wounds and localized abdominal tumors^[3] Muthu et al., 2006]. Experimentally, the seeds are reported as hepatoprotective, diuretic and antioxidant. In spite of the reporting of these positive benefits of the plant, most of the *Macrotyloma uniflorum* research studies are of small scale in nature. So, more and better trial data are needed to define the clinical effectiveness of this popular herbal remedy more precisely.

Hyperlipidemia is well known disorder to play a major role in the development of atherosclerosis, and is widely recognized as a risk factor for cardiovascular diseases

(CVD) and Myocardial infarction, which is a common cause of mortality and morbidity.^[5] Chronic elevation of blood lipids may also lead to the development of fatty liver and renal damage^[6], as indicated by the increased concentrations of liver and kidney enzymes. Accumulation of lipids impairs endothelial dysfunction, which can initiate vasoregulation, platelet and monocyte adhesion, vascular smooth muscle cell growth and oxidation of low-density lipoprotein (LDL)^[7] Although several factors such as life style, a diet rich in cholesterol, age, and hypertension, have been reported to cause heart failure,^[8] hypercholesterolemia due high levels of cholesterol, particularly LDL cholesterol (LDL-c), very low density cholesterol (VLDL-c) and due to decrease in the level of High density lipoprotein (HDL-c),^[9] is mainly responsible for CVD. Hence, decreasing the prevalence of hyperlipidemic conditions is considered to be an important therapeutic approach.^[10] Accordingly, efforts have been made to identify the anticholesterol effects of various medicinal plants.^[11] In the present study cholesterol diet which is present in all common ingredients in our daily food. Cholesterol feeding has been often used to elevate serum or tissue cholesterol levels to assess the hypercholesterolemia-

related metabolic disturbances in animals. Thus in the present study, an attempt was made to investigate the hypolipidemic properties of *Macrotyloma uniflorum*.^[4]

MATERIALS AND METHODS

Collection of specimens: The whole plant material of *Macrotyloma uniflorum* was collected from the nearby area of Guntur district fields in February 2017 and was authenticated by prof.D.Ramakanth raju retire botanist .

Preparation of plant extracts: Collected plant material has been dried under shade and made into coarse powder passed through sieve# 20 and has been successively Soxhleted using solvents like Petroleum ether, chloroform and ethanol for 72 hrs. Obtained extracts were made solvent free using rota evaporator and stored in vacuum desiccator. Yield was found to be 1.3%, 6.8% and 15% respectively. Obtained extracts were tested for preliminary phytochemical screening.^[12] Oral suspensions of the extracts were prepared at a dose of 100mg/ml using 5% aqueous gum acacia.

Acute toxicity studies: Adult swiss albino mice 20-25gm were taken for acute toxicity tests. The mice were divided into control and test groups containing 6 animals each. The control group receive vehicle (5% of normal saline) and the test group receive graded doses of extracts. The animals were observed carefully up to 4 hours then occasionally up to 48 hours for sign of any behavioral changes and motility and LD₅₀ values were calculated.^[13]

Selection of animals: Wistar albino rats weighing 150-200 g of either sex were used. The animals were fed with balanced diet and tap water *ad libitum*. The animals were maintained at room temperature and 40-70% RH with 12

h light period (6:00-18:00). The animals were divided into normal control, toxic control, standard, Test group-1 M.U.P.E, Test group-2 M.U.C.E, Test group-3 M.U.E.E. control group animals received normal saline of 0.1ml p.o, standard group received Atrovastatin (10mg/kg b.w p.o), and test groups of 100mg/kg b.w p.o, all the plant extracts and standard drug was suspended in 5% gum acacia solution. Except control group, rest of the group received cholesterol rich diet. Treatment was given for 20 days, mean while mean body weight of all animals was checked time to time. Cholesterol feeding has been often used to elevate serum or tissue cholesterol levels to assess hypercholesterolemia-related metabolic disturbances in experimental animal. On 21st day the blood samples were withdrawn from the arterial damage. All the lipid profile parameters were determined. Total cholesterol (TC), triglycerides (TG), High density lipoproteins (HDL), Very low density lipoproteins (VLDL), Low density lipoproteins (LDL) were analysed from serum.

STATISTICAL ANALYSIS

All the data expressed as mean \pm S.E.M and analyzed statistically using one way ANOVA followed by Dunnett's test and compare with respective control group. A value was of $p < 0.05$ was considered significant and $p > 0.05$ is ns= non significant.

RESULTS AND DISCUSSION

Results of phytochemical screening of the extracts were given in Table:1, and results of mean body weight which was checked time to time were given in Table:2, blood lipid profile of various groups results were given Table:3, results were plotted as bar graph which was given in Figure :1

Table. 1: Results of phytochemical screening on *Macrotyloma uniflorum* plant extracts.

| S. No | Tests | M.U.P.E | M.U.C.E | M.U.E.E |
|-------|--------------------------|---------|---------|---------|
| 1. | Alkaloids | + | - | + |
| 2. | Aminoacids | + | + | + |
| 3. | Carbohydrates | - | + | + |
| 4. | Flavonoids | - | - | - |
| 5. | Mucilage | - | + | + |
| 6. | Proteins | + | + | + |
| 7. | Starch | - | + | + |
| 8. | Steroids & Triterpenoids | + | + | + |
| 9. | Glycosides | - | - | - |

+ = present, - = absent

Table. 2: Effect of *Macrotyloma uniflorum* Linn extracts on body weight of cholesterol induced diet hyperlipidemic rat model.

| Days | Mean body weight(gm) change in body weight | | | | | |
|----------------------|--|-------------|-----|--------------------|--------------------|--------------------|
| | Normal | Cholesterol | STD | M.U.P.E (100mg/kg) | M.U.C.E (100mg/kg) | M.U.E.E (100mg/kg) |
| 0 th day | 140 | 142 | 143 | 141 | 140 | 140 |
| 5 th day | 143 | 149 | 145 | 149 | 143 | 145 |
| 10 th day | 148 | 167 | 152 | 156 | 149 | 151 |
| 15 th day | 151 | 175 | 160 | 169 | 157 | 156 |
| 20 th day | 155 | 199 | 170 | 182 | 165 | 164 |

Table. 3: Effect of *Macrotyloma uniflorum* Linn extracts on blood lipid profile in Cholesterol induced hyperlipidemic rat model.

| Groups | TC(mg/dl) | TG(mg/dl) | HDL(mg/dl) | VLDL(mg/dl) | LDL(mg/dl) |
|-------------------|----------------|-----------------|----------------------------|-----------------|-----------------|
| Control | 63.89±2.280 | 52.90±1.666 | 35.15±1.125 | 10.76±0.3387 | 15.00±2.656 |
| Cholesterol | 176.20±2.698** | 148.13±2.165*** | 19.71±1.221*** | 28.23±0.4326*** | 115.26±3.507*** |
| Standard | 99.22±0.9657* | 92.95±1.205* | 31.51±0.7098 ^{ns} | 17.78±0.2407* | 47.89±0.7986* |
| M.U.P.E(100MG/KG) | 148.54±1.231* | 128.23±3.205* | 22.22±0.412 | 28.52±0.6128* | 103.21±0.231* |
| M.U.C.E(100MG/KG) | 124.21±1.895* | 105.45±2.906* | 31.97±0.3054 | 19.68±0.5916* | 74.55±1.561* |
| M.U.E.E(100MG/KG) | 145.46±3.669* | 124.75±3.978* | 27.12±1.546 | 24.66±0.7609* | 94.77±3.825* |

Values are mean±SEM, n=6, **p<0.01, when compared with control Group

* p<0.01, when compared with Toxic Group

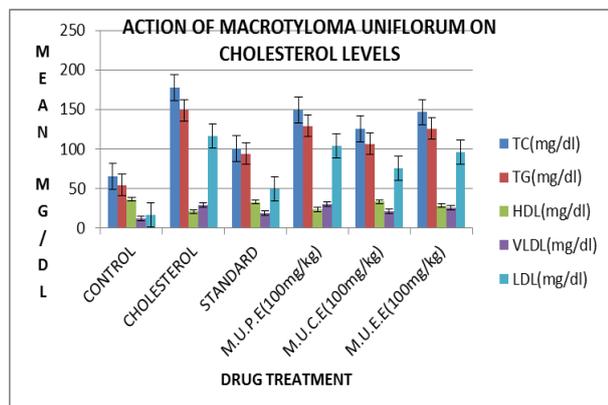


Fig. 1: Graphical representation of *Macrotyloma uniflorum* Linn extracts on cholesterol diet induced hyperlipidemic model in wistar albino rats.

DISCUSSION

From the results of phytochemical screening it was found to be Petroleum ether extract of *Macrotyloma uniflorum* Linn (Test group-1) reveals the presence of carbohydrates, flavonoids, proteins, starch, steroids and triterpenoids. (Test group-2) Chloroform extract reveals the presence of alkaloids, amino acids, flavonoids, carbohydrates, proteins and starch. (Test group-3) Ethanolic extract reveals the presence of alkaloids, amino acids, flavonoids, carbohydrates, mucilage, starch and glycosides.

Cholesterol feeding alone however does not affect the serum TG level. It is assumed that a high level of saturated fat in addition to cholesterol is required to significantly elevate serum Triglycerides level in rat model.

Hyperlipidemia has been documented as one of the causative factor for atherosclerosis, resulting in coronary heart disease. Elevated cholesterol particularly low density lipoprotein (LDL-c) is the major reasons attributed to CVD. Accordingly to WHO by 2020, 60% of the CVD causes will be of Indian origin.^[14]

Development of atherosclerotic disease is a complicated process involving accumulation of lipid-containing particles in the walls of coronary arteries other major arteries in the body. Similarly the present study there was a significant weight gain in cholesterol control (toxic), as compared to normal control groups. Treatment with

Macrotyloma uniflorum plant extracts significantly reduced the weight gain; lowering high cholesterol levels significantly reduce the risk of heart attacks, strokes, and death. A rise in the LDL may cause deposition of cholesterol in arteries and aorta and it is a direct risk factor for CHD.^[15]

In the present study there was an elevation in serum and tissue cholesterol, LDL-C, and VLDL-C level in response to cholesterol induced (toxic) compare to normal control group. Treatment with *Macrotyloma uniflorum* selected plant extracts significantly reduced serum and tissue cholesterol, LDL-C, and VLDL-C levels.^[16] The decrease in triglyceride level is an important finding of experiment. Recent days studies shows that triglycerides are independently related with coronary artery disease. Treatment with *Macrotyloma uniflorum* plant extracts showed significant decreased in triglyceride.

HDL is synthesized mainly in intestine and liver. HDL is considered to be a beneficial lipoprotein as it has an inhibitory effect in the pathogenesis of atherosclerosis. Low level of HDL is associated with high risk of coronary artery disease. In the present study HDL-C level in serum were significantly increased by chloroform extract and ethanolic extract .

The activity of Cholesteryl Ester Transfer Protein (CETP), a key enzyme in reverse cholesterol transport and HDL metabolism increase in high fat diet and mediates the transfer of cholesterol esters from HDL-C to triglyceride-rich particles in exchange for triglycerides. This leads to increased plasma concentrations of TG's & decreased concentrations of HDL-C.

CONCLUSION

From this work we conclude that all the *Macrotyloma uniflorum* posse's ability to decrease cholesterol levels in the body. *Macrotyloma uniflorum* Linn chloroform extract possess highly significant action towards reducing the body cholesterol. Hence the folklore usage has been validated and can be treated as Nutraceutical.

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