Effect of 50% Hydro-Ethanolic Leaf Extracts of *Ruellia Tuberosa* L. and *Dipteracanthus Patulus* (Jacq.) on Lipid Profile in Alloxan Induced Diabetic Rats

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ABSTRACT

Background: The study was undertaken to investigate the effect of 50% hydro-ethanolic leaf extracts of *Ruellia tuberosa* L. and *Dipteracanthus patulus* (Jacq.) on lipid profile in alloxan induced diabetic rats.

Method: In lipid profile the parameters studied were serum total cholesterol, phospholipids, triglycerides, HDL-c, LDL-c and VLDL-c level. Extracts were orally administered daily for 30 days at a dosage of 250 and 500 mg/kg bodyweight to alloxan induced diabetic rats.

Results: The levels of phospholipids, triglycerides, LDL-c and VLDL-c were significantly (P < 0.05) reduced. The HDL-c level was found to be increased in the treatment groups. Total cholesterol level was found to be significantly (P < 0.05) decreased at 500 mg/kg bodyweight of both the plant extracts treated groups.

Conclusion: The results further suggests that the effect of plant extract treated groups was found to be lower in reducing the lipid levels in serum when compared to the drug (Glibenclamide 600 μg/kg body weight) treated group.

Keywords: *Dipteracanthus patulus* (Jacq.), lipid profile, *Ruellia tuberosa* L.

INTRODUCTION

Diabetes mellitus is a heterogeneous metabolic disorder characterized by altered carbohydrate, lipid and protein metabolism.[1] The chronic hyperglycemia of diabetes is associated with long term damage, dysfunction and failure of various organs. In diabetic rats, the utilization of impaired carbohydrate leads to accelerate lipolysis, resulted in hyperlipidemia.[2] However, complete cure of the disease has been eluding physicians for centuries and the quest for the development of more effective anti-diabetic agents is pursued relentlessly. Many herbal products, including several metals and minerals have been described for the cure of diabetes mellitus in ancient literature.[3]

*Ruellia tuberosa* L. is a tropical plant and widely distributed in Southeast Asia. In folk medicine, it has been used as anti-diabetic, antipyretic, analgesic, anti hypertensive, thirst-quenching, and
antidotal agent.\cite{4} *Dipteracanthus patulus* (Jacq.) belongs to the family *Acanthaceae*, it is used for curing eyesore by introducing the extract into the eyelid. It is commonly known as Kiranthinayagam or Kayappacchilai in Tamil. The leaves were ground into paste and used to treat fresh wounds, itches, insect bites, venereal diseases, sores, tumors and rheumatic complaints.\cite{5} Pharmacological and phytochemical studies indicate that it has cardiotonic activity.\cite{6}

**METHODS**

**Plant material**

The fresh leaves of *Ruellia tuberosa* L. and *Dipteracanthus patulus* (Jacq.) were collected from ABS (Altogether Botanical Species) Medicinal Plants Garden, Karipatti, Salem, Tamil Nadu, India. The plant was identified by the herbarium of Botanical Survey of India (BSI) southern circle, Tamil Nadu Agricultural University (TNAU) (No: BSI/SC/5/23/08-09/Tech- 118, 229).

**Preparation of 50% hydroethanolic leaf extracts of *Ruellia tuberosa* L. and *Dipteracanthus patulus* (Jacq.)**

The fresh leaves of *Ruellia tuberosa* L. and *Dipteracanthus patulus* (Jacq.) collected (6 kg), were shade dried for five days and crushed to coarse powder (3 kg). The coarse powder thus obtained was cold macerated with 1.5 liters of 50% ethanol (Ethanol:Water in 1:1 ratio) and kept for 3 days at room temperature, with occasional stirring.\cite{7} The suspension was filtered through a fine muslin cloth and was evaporated to dryness at a low temperature (at 40°C) under reduced pressure in a rotary evaporator. Dark brown colored crystals obtained were used for the studies.

**Experimental animals**

Healthy swiss albino rats of six to eight weeks old weighing about 110-120 g were obtained from the animal facility of PSG Institute of Medical Science and Research (No: 158/1999/CPCSEA), Coimbatore, India. The rats were grouped and housed in polyacrylic cages and maintained under standard conditions (25 ± 2°C) with 12 ± 1 h dark/light cycle. The animals were fed with rat pellet feed supplied by Hindustan Lever Ltd., Bangalore, India and water *ad libitum*. All procedures described were reviewed and approved by the Animal Ethical Committee (AEC).

**Induction of diabetes mellitus**

Alloxan monohydrate was used to induce diabetes mellitus in normoglycemic rats. Animals were allowed to fast for 18 h and were injected intraperitoneally with freshly prepared alloxan monohydrate in sterile normal saline at a dose of 120 mg/Kg body weight.

**Treatment groups**

The animals were divided into seven groups of six animals in each group, after two week acclimatization period. Group I (Normal control + normal saline 5 ml/kg body weight), Group II (Diabetic control), Group III (Drug control - Glibenclamide 600 μg/kg body weight), Group IV (Diabetes + 250 mg/kg body weight 50% HERT), Group V (Diabetes + 500 mg/kg body weight 50% HERT), Group VI (Diabetes + 250 mg/kg body weight 50% HEDP), Group VII (Diabetes + 500 mg/kg body weight 50% HEDP). (50% HEDP/HERT – hydroethanolic leaf extract of *Ruellia tuberosa* L./*Dipteracanthus patulus* (Jacq.)). After the end of experimental period (30 days), the rats were fasted overnight and sacrificed by cervical decapitation. Serum was separated from the blood collected, by centrifugation and the serum was stored at −4°C for biochemical analysis.

**Biochemical analysis**

Estimation of serum cholesterol was done by Richmond (1973),\cite{8} HDL-cholesterol was determined by Castelli *et al.*\cite{9} Triglyceride and phospholipid was estimated by Philip and Mayne (1994),\cite{10} Raheja, *et al.*\cite{11} VLDL (Very Low Density Lipoprotein) - cholesterol was calculated by; triglyceride/5; LDL (Low Density Lipoprotein) cholesterol. Cholesterol was calculated by the equation of Friedewald *et al.*\cite{12} LDL-c = total cholesterol (HDL-c + VLDL).

**Statistical analysis**

Data was reported as mean ± SD by using the Statistical Package of Social Sciences (SPSS). The data for all the parameters was analyzed by using Analysis of Variance (ANOVA) and the group means were compared by Duncan’s Multiple Range
RESULTS
The results of the serum lipid profile [Figures 1 and 2] shows that in alloxan induced diabetic rats (Group II) there was not only hyperglycemia but also hyperlipidemia in which serum triglycerides, total cholesterol and phospholipids levels were increased significantly when compared to the control group (Group I). Treatment of diabetic rats with 50% hydro-ethanolic leaf extracts of Ruellia tuberosa L. and Dipteracanthus patulus (Jacq.) (Group IV to VII) for 4 weeks resulted in a significant decrease in serum phospholipids, triglycerides, LDL-c and VLDL-c and increase in HDL-c level was found as compared to diabetic control. Total cholesterol level was found to be significantly decreased in the administration of 500 mg/kg body weight of 50% hydro-ethanolic leaf extracts of Ruellia tuberosa L. and Dipteracanthus patulus (Jacq.). Group treated with Glibenclamide 600 μg/kg body weight was found to be effective in lowering the lipid profile level as compared to plant extracts treatment groups.

DISCUSSION
It has been established that diabetes mellitus causes change in the normal metabolism of lipids in diabetic rats.[14] It is seen that cholesterol and triglyceride were elevated in diabetic condition[15] such an elevation represented the risk factor for coronary heart disease.[16] There was a reduction in the cholesterol and triglyceride level of diabetic rats after 50% hydro-ethanolic leaf extracts of Ruellia tuberosa L. and Dipteracanthus patulus (Jacq.) treatment. It is well known that LDL plays an important role in arteriosclerosis and that hypercholesterolemia, which is associated with a defect relating to the lack of LDL receptors. In diabetes mellitus, the level of VLDL will be increased with a decrease in HDL.[17] Contrary to our results, Vinuthan, et al.,[18] have reported that VLDL and LDL level was found to be decreased and HDL level was increased during plant extracts treatment.

CONCLUSIONS
This study has shown that, oral administration of 50% hydro-ethanolic leaf extracts of Ruellia tuberosa L. and Dipteracanthus patulus (Jacq.) was not effective in reducing the serum lipid levels associated with diabetes mellitus when compared to that of the drug (Glibenclamide 600 μg/kg body weight) administered. We suggest that the lowering of lipids to certain level by 50% hydro-ethanolic leaf extracts of Ruellia tuberosa L. and Dipteracanthus patulus (Jacq.) may be due to the presence of phytochemicals, which has been reported already.[19] However, further pharmacological investigations are needed to find out the mechanism of action of the active components involved.

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