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Antidiabetic and hypolipidemic effect of extract of leaves of *Aegle Marmelos* in alloxan induced diabetic rats

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ABSTRACT

In the tribal people of Satpuda Valley, leave's powder of the *Aegle marmelos* is used in diabetis mellitus, but no systematic and scintific investigations were conducted on this powder for anti-diabetic activity. In the present study, hydro-alchoholic extract of the leaves of *Aegle marmelos* was collected and subjected for evaluation of anti-daibetic activity in alloxan induced diabetic rats. The rats of group-II to V were divided with alloxan monohydrate at a dose of 200 mg/kg body weight subcutaneously. After fortnight the rats of groups III,IV and V were orally recived 25, 50 and 100 ml/kg of hydro-alchoholic extract of the leaves of *Aegle marmelos* daily respectively. The duration of experiment is 45 days. At the end of experimental period, blood was estimated for blood glucose level and the lipid profile. The result shows significant decrease in level of glucose, Serum cholesterol, Triglycerides and Phospholipids in the rats treated with hydro-alchoholic extract of the leaves of *Aegle marmelos* at a dose of 100ml/kg as compare to untreated rats. Hence, the hydro-alchoholic extract of the leaves of *Aegle marmelos* has exhibited anti-diabetic and hypolipidemic activity.

KEYWORDS

Aegle marmelos;
hydro-alchoholic extract;
Anti-diabetic activity.

INTRODUCTION

Diabetes, a chronic progressive disorder characterized by metabolic abnormalities, has reached epidemic proportions world wide. Statistic reveals that India will be the *diabetes* capital of world. world wide projections suggest that more than 220 million peoples will have *diabetes* by the year 2010. ref oral hypoglycemic agents used for the treatment of *diabetes* have side effect on prolonged use the patients are using herbal medicines which have less side effects easy availability and economic for them. Even world heath organization (WHO) permits the use of plant drug for different diseases, including *diabetes mellitus*. Ref *Diabetes mellitus* is a chronic disease characterized by derangement in carbohydrates, fats and protein metabolism[1]. Long before the use of insulin indigenous remedies have been used for the treatment of *diabetes mellitus*. There is increasing demand by patients to use the natural products with antidiabetic activity. This is because insulin cannot be used orally and continuous insulin injection has many side effects and toxicity. Beside certain oral hypoglycemic agent are not effective in lowering the blood sugar in chronic diabetic patients[2]. Despite considerable progress in the treatment of diabetes by oral hypoglycemic agents, search for newer drugs contin-

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ues because the existing synthetic drugs have several limitations. In recent times there has been renewed interest in plant remedies[3]. In the traditional systems of Ayurvedic treatment medicines consist of plant products, either single drug or in combination with others, which are considered to be lees toxic and free from side effects compared to synthetic drugs[4].

Aegle marmelos (Family:Rutaceae) known as bael, moderate size slender, aromatic tree, 6-7 m in height, 92-120 cm in girth, growing wild throughout in India. The powder leaves along with black pepper is given in diabetes. The active principal in leaf extract shows hypoglycemic activity similar to insulin[5].

The cultivated tree used to treat diabetes melltius[6]. Orally administered extract of the leaves of *Aegle marmelos* shows Anti-oxidant activity against experimentally induced diabetic rats[7]. Extract of various part of bael tree gives *in vitro* antiviral activity[8]. Water extract of bael fruit gives hypoglycemic effect[9*]. The extract of bale given anticancer activity[10]. The methanolic extract of leaves of *Aegle marmelos* gives anti diarrhoeal activity in caster oil indused mice[11]. In the tribal people powder of leaves of *Aegle marmelos* used in diabetes mellitus, but no systemic and scientific investigation were conducted on this extract for anti diabetic activity. In the present study, hydro-alchoholic extract of air-dried leaves of *Aegle marmelos* was collected and was subjected for evaluation of anti diabetic activity.

MATERIALS AND METHODS

Plant material

Fresh leaves of *Aegle marmelos* were collected from medicinal plant garden of college of pharmacy, faizpur, Dist-jalgaon, maharashtra (india). The leaves were shade dried crushed into coarse powder and store in well closed container for further use.

Preparation of extract

The hydro-alcoholic extract of powdered leaves were collected by using soxhlet extractor.after extraction the solvent was distiiled off and extract was concentrated to form dry residue.

Animals

Male Swiss albino rats of body weight 120-240gm were obtained from (Hindustan antibiotics, Pune). Animals were housed under standard condition of temperature (25±2^{0}C), 12h/ 12h light dark cycle and feed with standard pellet diet and water was given *ad libitum*. Animal handling was performed as per *Good Laboratory Practice*. A research proposal was prepared according to the guideline of Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA). The Institutional Animal Ethical Committee (IAEC) of College of Pharmacy, Faizpur approved the proposal.

Drugs

The suspension of extract was prepared in distill water and administered in the dose of

Induction of diabetes

Diabetes was induced by intraperitonial injection of Alloxan monohydrate (5% w/v) in physiological saline. At a dose of 200mg/kg body weight[12]. Alloxan monohydrate was purchased from LOBA chemie, mumbai. The diabetes state was confirmed after 48h of alloxan injection by weight loss and glucoseurea[13], and hyperglycemia[14].

Experimental procedure

Male albino rats were divided into five groups of six rats in each. The group I was kept as control and the rats of group II to V are the diabetes-induced rats. The second group was alloxan diabetic rats fed on normal saline and lab diet. The rats of group III, IV and V were orally received 25,50 and 100 ml/kg of hydro-alchoholic extract of the leaves of *Aegle marmelos* daily, respectively. The duration of the experiment was 45 days[4].

Biochemical estimation

At the end of experimental period the animals were deprived of food overnight and killed by decapitation. Blood was collected in two separate tubes. One tube containing potassium oxalate and sodium fluoride was used for estimation of blood glucose. The other tube containing the blood was allowed to clot at room temp. Serum separated after centrifugation was used for estimation of lipid profile. The anti diabetic effect of the drug was assessed by determining the blood glucose[15]

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TABLE 1: Serum level of glucose, cholesterol, triglycerides and phospholipids in alloxan diabetic rats and in drug treated rats. (Values expressed as mg/dl serum.)

Parameters	Group I control	Group II alloxan diabetic rats	Group III rats given 25ml/kg of drug	Group IV rats given 50ml/kg of drug	Group V rats given 100ml/kg of drug
Blood glucose	115±1.78	313a±12.13	195a±15.62	180b±6.52	155a±9.68
Cholesterol	74±1.77	131b±5.21	106c±4.62	95b±3.65	83a±2.53
Triglycerides	7.9±0.22	20a±0.66	12.2b±0.54	10.2c±1.23	9.52c±1.31
Phospholipids	166±3.9	185b±4.61	178b±6.02	173b±3.57	170b±3.60

Average of values of from 6 rats in each group ± S.D. Group II has been compared with Group I. Group III, IV and V has been compared with Group II. a= P<0.01, b= P between 0.002 and 0.001, c= P between 0.01 and 0.002

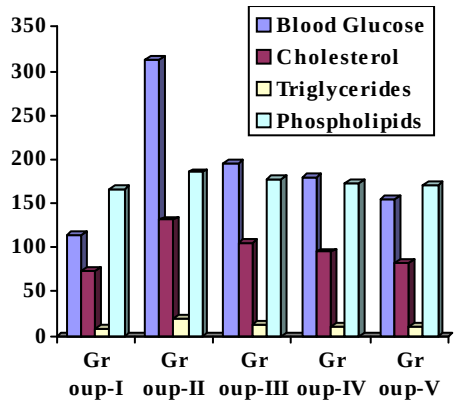

Figure 1: Levels of blood glucose, serum cholesterol, triglycerides and phospholipids in alloxan diabetic rats and in drug treated rats

hypolipedemic activity of drug of drug was assessed by determining concentration of serum cholesterol[16] triglycerides[17] phospolipids[18]. The overall protective effect of the drug was assessed by comparing the aforementioned biochemical parameters of group II with group I and group III, IV, V with group II.

Statistical analysis

The quantitative measurements were made on six animals in each group and the values were expressed as mean ±SD. Data obtained were subjected to student-t-test. Significance of test was determined by P value.

RESULT

TABLE 1 depicits the level of blood glucose, serum cholesterol, Triglycerides & Phospholipids in five different groups. All these parameters showed an increase in alloxan diabetic rats. But experimental rats treated with hydro-alcoholic extract of the leaves of *Aegle marmelos* showed decrease in the level of blood glucose, serum cholesterol, triglycerides and phospholipids, but group-V which received 100ml/kg of drug showed more significant decrease in all these parameters. The result revealed a well defined role of the drug in suppressing glucose level in alloxan diabetic rats.

DISCUSSION

Alloxan has been known to induce diabetes mellitus in experimental animals, which may be due to massive reduction of β-cells of islets of langarhans and induce hyperglycemia[4]. Present study shows that the drug can reverse this effect (significance level P<0.05). The possible mechanism by which this medicine brings about it hypoglycemic action may be potentiating the insulin effect of plasma by increasing either the pancreatic secretion of insulin from β-cells of islets of langarhans or its release from the bound form.

A reversal of hyperlipidemia was observed by administration of drug. Numerous studies reveal such hypoglycemic and hypolipidemic action to various medicinal plants[19-21]. The result of present study reveals that the continuous oral feeding of the drug prevents elevation of the level of the serum lipids secondary to diabetic state. Thus decrease in serum cholesterol, triglycerides and phospholipids is a favorable biochemical change in preventing autherogenic development in diabetes and thus the drug can be described biochemically as a cardioprotective agent for diabetes.

CONCLUSION

From this study we can conclusively state that the drug has beneficial effect on blood glucose level as well as rectifying hyperlipidemia due to diabetes. Hence, to put in to a nutshell, the active principle/s of the hydro-

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alcoholic extract of the leaves of *Aegle marmelos* may be responsible for antidiabetic and antihyperlipidemic activity. However, it needs phytochemical investigation and screening active principle/s to pin point the activity of drug.

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