An Elsevier Indexed Journal ISSN-2230-7346

Journal of Global Trends in Pharmaceutical Sciences

EVALUATION OF ANTIDIABETIC ACTIVITY OF *MELOCHIA CORCHORIFOLIA* LEAVES ON ALLOXAN INDUCED DIABETIC RATS

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ARTICLE INFO

Key Words

Melochia corchorifolia, Alloxan monohydrate, Antidiabetic activity.

ABSTRACT

Objective: The present study was carried out to investigate the antidiabetic activity of Ethanolic extract of *Melochia corchorifolia* leaves. **Methods:** EEMC was administered orally at 250 and 500 mg/kg b.w doses to Alloxan induced diabetic rats and oral glucose tolerance test was performed by inducing hyperglycemia via administration of glucose (2g/kg b.w) in water. Fasting blood glucose level and biological parameters like Serum triglycerides, cholesterol, HDL, LDL and VLDL was performed to the evaluation of hypoglycemic effects. **Result:** Ethanolic extract of *Melochia corchorifolia* leaves shows significant decrease in blood glucose level observed within 90mins in glucose tolerance test. In alloxan induced diabetic rats, daily oral treatment with ethanolic extract of *Melochia corchorifolia* leaves for 21 days treatment which significantly reduce the blood glucose level. The altered level of biochemical parameters in diabetic animal's compared to normal indicating impaired metabolic functions were also significantly improved by the oral administration of EEMC. **Conclusion:** The result suggests that the ethanolic extract of *Melochia corchorifolia* leaves shows the significant antidiabetic activity.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by the deficiency in the production of insulin and its action or both. This leads to prolonged hyperglycemia due to disturbance in the metabolic process inside the body [1]. DM is considered as one of the five leading cause of death in the world [2]. In generally there are two types of DM based on dependent i.e., Type I and Type II diabetes mellitus, type I diabetes mellitus is also called immature diabetes which depends on insulin and it will affects 5% diabetic population. Type II diabetes is also known as non-insulin dependent and it generally affects the peoples of age 40 years[3].

The major cause of diabetes is premature illness occurs due cardio vasculardisease, blindness and kidney failure. Number of therapies is used to treat diabetes mellitus compared to herbal medicines allopathic medicines produce unwanted side effects. The herbal medicines having similar mechanism of action as allopathic medicines but it has negligible side effect with low cost [4]. So many herbal medicines are used for the treatment of diabetes. As per ethno botanical information, 800 plants have been characterized with antidiabetic activity [5]. The *Melochia corchorifolia* is also known as Chocolate weed and it is an annual or perennial type of herb, typically seen in the

wastelands. It belongs to the family Sterculiaceae. The leaves and roots of *M.corchorifolia* are used to treat urinary disorders, abdominal swelling, dysentery and snakebite. This plant contains various Phytoconstituents like Alkaloids, glycosides, Terpenoids, steroids, phenolic compounds and flavonoids. The Extract of this plant shows the following pharmacological activities like anthelmintic, diuretic, hepatoprotective, antioxidant, antibacterial, anticancer, Antiurolithiatic and CNS stimulant activities [6].From the literature survey, this plant was not established for alloxan induced diabetic model. Hence, our main aim is to evaluate anti-diabetic activity of *Melochia corchorifolia* leaves in alloxan induced diabetic rats and oral glucose tolerance test.

MATERIALS AND METHODS

Plant material: The fresh leaves of *Melochia corchorifolia* leaves were collected from the local area of Bharathinagara, Mandya District and Karnataka state and authenticated by Dr. Gurukar Mathew. Associate professor and Head of the department ofbotany, Bharathi College Bharathinagara. The leaves were dried under shade condition and crushed into coarse powder.

Preparation of plant extract: The powder was subjected to hot continuous extraction with 70% ethanol in a soxhlet extractor. After completion of extraction, the extract was subjected to vaccum evaporator and then concentrated to dry residue in a desiccator over anhydrous calcium chloride. A dark green residue was obtained.

Phytochemical screening:

The ethanolic extract of *Melochia corchorifolia* leaves was subjected to quantitative phytochemical analysis for the identification of Phytoconstituents viz., Alkaloids, Flavonoids, Saponins, Tannins, Sterols and Proteins [7].

Experimental animals:

Healthy albino wistar rats of either sex (180-200 g) are used for the antidiabetic activity. Animals were obtained from the animal house of Bharathi College of pharmacy, Bharathinagara. The animals were acclimatized for 7 days in the experimental area of Bharathi College of pharmacy, Bharathinagara. They were housed in the polypropylene cages under the standard conditions (12h light and dark cycles, 25±3º C and 50-60% relative humidity).Study was performed as per the guidelines of Institutional animal ethics committee (BCP/IAEC/PCOL/01/2019).

Oral glucose tolerance test: The effect of EEMC was evaluated on glucose loaded animals. Overnight fasted rats were separated into four groups of six animals each. Group I served as normal control. Group II received glucose solution (2 g/ kg) and glibenclamide. Group III and IV were given orally glucose (2 g/kg) with the EEMC at doses of 250 and 500 mg/kg b.w. respectively. Blood samples were collected from the animals at 0, 30, 60 and 90 minutes after the administration of glucose and glucose level were analysed [8].

Alloxan induced diabetes mellitus:

Induction of Diabetes mellitus:Diabetes mellitus was induced by the administration of alloxan monohydrate (120mg/kg. b.w). Albino rats were treated with the single intraperitoneal injection of Alloxan monohydrate which is prepared by dissolving it in the saline (0.9%). Fasting blood glucose level of the animal was checked after 72 hours. Animals with blood glucose level > 250mg/dl were separated and divided into different groups comprising of 6 rats in each groups were taken for the antidiabetic study. The treatment (p.o) was started to the diabetic induced rats for a period of 21 days except normal control group. During this period, Animals were free access to standard diet and water. Blood glucose level was measured on 1st, 7th, 14th and 21st day of the treatment [9].

Collection of blood sample:

Blood samples were collected from the tail nipping and Blood glucose level was measured by using Glucometer (Accu check). On 21st day of treatment blood samples was collected from overnight fasted rats by retro orbital under mild ether anaesthesia for the estimation of biochemical parameters like Serum triglycerides, Serum total cholesterol, Serum HDL, Serum LDL and Serum VLDL [10].

Table 01: Preliminary phytochemical analysis

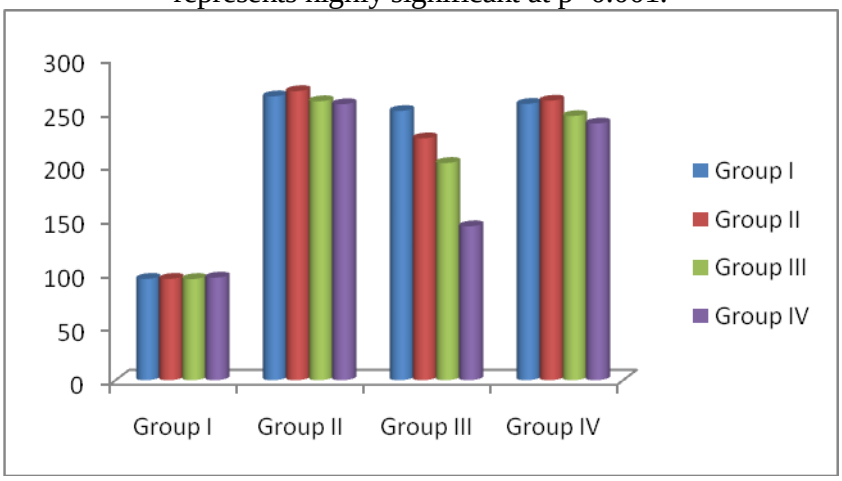
S. No	Tests	Results
01	Carbohydrates	+
02	Flavonoids	+
03	Alkaloids	+
04	Tannins	+
05	Steroids	-
06	Saponins	+
07	Proteins and Amino acids	+
08	Saponins	+

Table 02: Effect of ethanolic extract of *Melochia corchorifolia* leaves on OGTT

Groups (n=6)	Dose(mg/kg)	0 min	30 mins	60 mins	90 mins
Vehicle control	-	74±1.31	127±1.76	131±2.06	120±1.72
Glibenclamide	5	73±1.25	96±1.25***	94±1.75***	92±2.15**
Glucose + EEMC	250	72±1.11	113±1.43*	117±1.85**	119±1.81*
Glucose + EEMC	500	72±1.76	99±1.47**	100±2.31*	98±1.66**

Values are expressed as mean ± SEM (n=6). The data were statistically analyzed by One way ANOVA followed by Dunnett's test.

Where, * represents significant at p<0.05, ** represents moderate significant at p<0.01 and *** represents highly significant at p<0.001.



Graph No.1: Effect of EEMC on Oral glucose tolerance test

Table 03: Effect of ethanolic extract of *Melochia corchorifolia* leaves on alloxan induced Diabetic rats

Groups n=6	1st day	7th day	14th day	21st day
Control	94.33±0.8433	94.33±1.054	94.17±0.9458	95.50±0.7638
DC	257±2.176	259.8±2.594	264.3±1.145	269.2±4.568
Standard	250.7±2.431***	225.2±3.341***	202.3±3.712***	143.3±2.985***
Low dose	257.3±2.459*	260.3±1.453*	246.8±3.628*	239.0±3.941*
High dose	254.3±1.944**	251.0±3.396**	233.5±3.640***	169.2±2.688***

Values are expressed as mean ± SEM (n=6). The data were statistically analyzed by One way ANOVA followed by Dunnett's test.

Where, * represents significant at p<0.05, ** represents moderate significant at p<0.01 and *** represents highly significant at p<0.001.

Graph No.2: Effect of EEMC on Blood glucose level in Alloxan induced diabetic rats

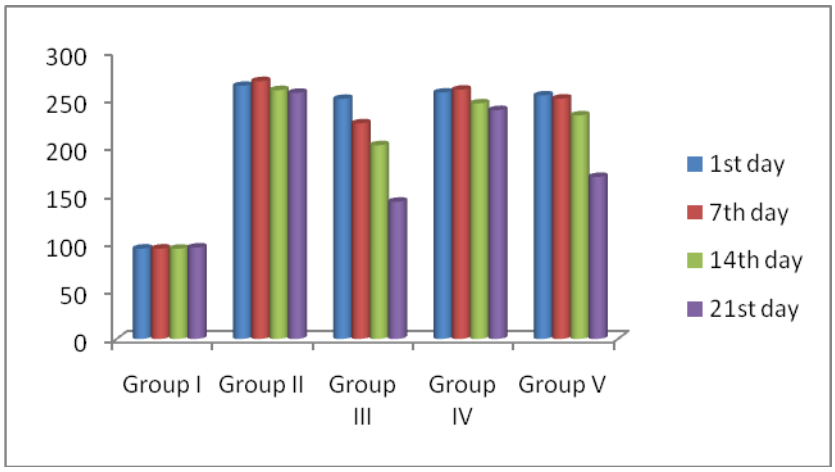


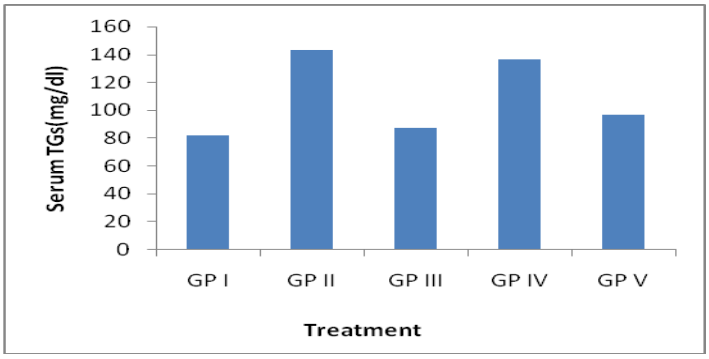
Table 04: Effect of ethanolic extract of *Melochia corchorifolia* leaves on serum profile in Alloxan induced diabetic rats after 21 days treatment

Groups	Biochemical parameters (mg/dl)				
	TG	TC	HDL	LDL	VLDL
GP I	81.95 ±0.6103	85.3 ± 0.5334	51.78±0.5714	39.66±0.7000	20.79±0.3519
GP II	143.1 ±0.4590	194.72±0.3654	35.10±0.6000	69.00±0.7853	41.48±0.6483
GP III	87.28 ±0.8550***	91.17 ±0.2770***	48.47±0.9615***	40.97±0.5045***	21.03±0.6216***
GP IV	139.69±0.5072*	133.68±0.5606*	41.19±0.4927*	52.34±0.7978*	33.34±0.8750*
GP V	96.74 ±0.6968**	98.96 ±0.3444**	47.60±1.106**	40.44±0.6636**	28.57±0.4786**

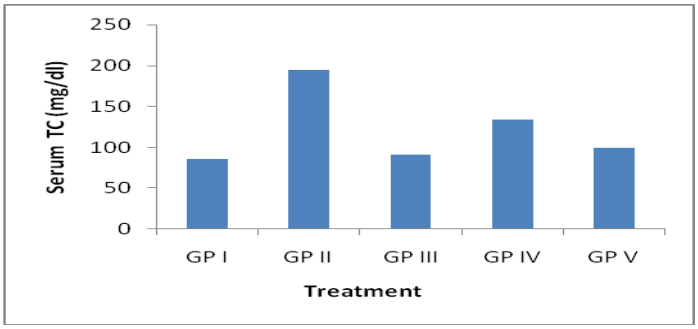
Values are expressed as mean ± SEM (n=6). The data were statistically analyzed by One way ANOVA followed by Dunnett's test.

Where, * represents significant at p<0.05, ** represents moderate significant at p<0.01 and *** represents highly significant at p<0.001

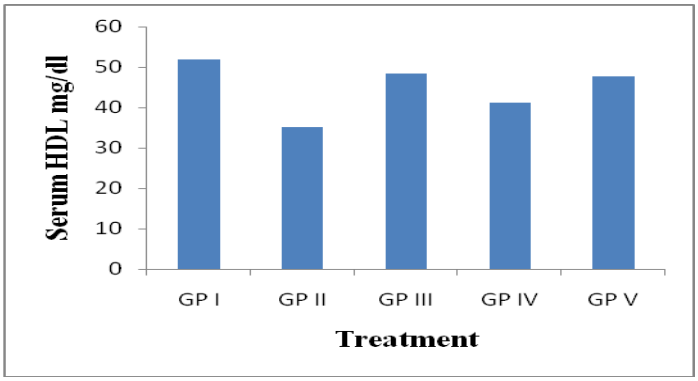
Graph No.3: Effect of EEMC on serum TG level in alloxan treated diabetic rats



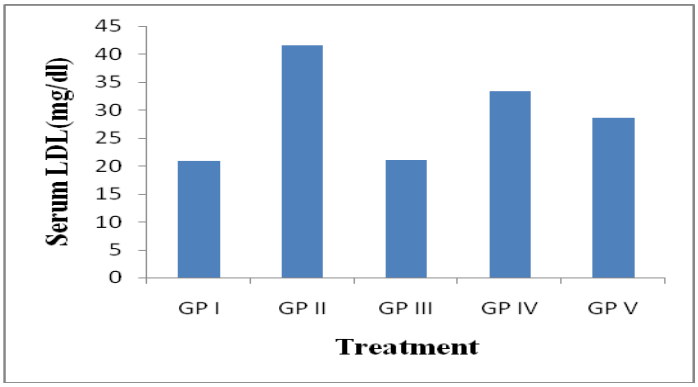
Graph No.4: Effect of EEMC on serum TC level in alloxan treated diabetic rats



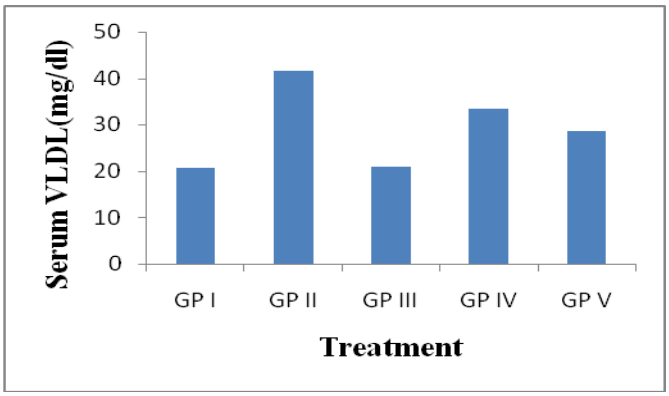
Graph No.5: Effect of EEMC on serum HDL level in alloxan treated diabetic rats



Graph No.6: Effect of EEMC on serum LDL level in alloxan treated diabetic rats



Graph No.7: Effect of EEMC on serum VLDL level in alloxan treated diabetic rats



Statistical analysis: The data obtained was represented as Mean ± SEM. The statistical significance was computed using One Way ANOVA followed by Dunnett's multiple comparison test and compared with diabetic control group where the n=6 animals in each group were used.

Oral glucose tolerance test: In oral glucose tolerance test, the blood glucose levels were estimated before and after drug treatment at different time intervals (Table 1). In the vehicle control group the blood glucose was found to increase from 74 ± 1.31 to 127 ± 1.76 in first 30 minutes. After 60 minutes of glucose loading, the blood glucose level was increased to 131 ± 2.06 and then slight decrease from 131 ± 2.06 to 120 ± 1.72 was observed at 90 minutes. In EEMC treated animals, only a little elevation in blood glucose was seen at the dose of 250 and 500 mg/kg. Maximum glucose tolerance was seen at 90 minutes with EEMC at dose 500 mg/kg. A consistent and significant fall in blood glucose level was observed in rats treated with glibenclamide (5mg/kg) at 30, 60 and 90 min after glucose administration.

Alloxan monohydrate induced diabetes mellitus: Administration of Alloxan monohydrate leads to elevation in blood glucose level in rats. In Alloxan induced diabetic rats the fasting blood glucose level was found to increase from 257±2.17 to

269.2±4.56mg/dl. Oral administration of EEMC 250 mg/kg showed a significant (P<0.05) decrease in blood glucose level from 257.3 ± 2.45 to 239±3.94as compared with diabetic control. The daily treatment of rats with EEMC leads to dose dependent fall in blood glucose level (Table 3). EEMC at all doses showed significant (P<0.01) decrease in blood glucose level but effect at 500 mg/kg was superior. In the standard drug treated group, blood glucose was found to decrease throughout the study.

Serum lipid profile: Serum lipid profile is one of the major risk factors in type II DM, which can be observed from the liquid profile data. Compared with diabetic control group, the EEMC (250-500mg/kg) groups showing reduction in the Serum levels of total glycerides, total cholesterol, HDL, LDL and VLDL.

DISCUSSION AND CONCLUSION

Diabetes mellitus is one of the major common chronic diseases and is associated with hyperlipidaemia and comorbidities such as obesity and hypertension. Hyperlipidaemia is a metabolic complication of both clinical and experimental diabetes [11]. Previous studies suggested that hyperlipidaemia and hyperglycaemia are common characteristics in the alloxan induced diabetic rats [12]. The maximum reduction in the blood glucose levels was seen in the EEMC at the dose of 500mg/kg. Hence, we could say that EEMC had a beneficial effect on carbohydrate metabolism in the diabetic rats. We have also observed an increase in the concentration of TG, TC, LDL and VLDL in the alloxan induced rats. EEMC enhance the activity of enzyme involved in the synthesis of bile acid and its excretion, this may have decrease the serum triglycerides and serum cholesterol level. The EEMC treated groups (250-500mg/kg) shows significant effect in serum lipid profile in the alloxan induced diabetic rats compared to the Diabetic control groups. EEMC exhibited significant hypoglycaemic activities in Alloxan induced diabetic rats. The extract showed improvement in various serum and body parameters as well as regeneration of β cells of pancreas might be of value in diabetes. From the present study, we concluded the anti-diabetic activity of Ethanolic extract of *Melochia* corchorifolia leaves.

ACKNOWLEDGMENT:

We authors wish to thank our management, principal of Pharmacy College for providing all facilities in the college.

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