

Evaluation of Antidiabetic Potential of *Maytenus emarginata* Leaves in Alloxan Induced Diabetic Rats

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Abstract - *Maytenus emarginata* (Wild.) Ding Hou (Celastraceae) fresh leaves juice is traditionally used by diabetic patients in Vidarbha region. The present study was aimed to investigate the anti-diabetic potential of aqueous extract of *Maytenus emarginata* leaves in alloxan induced diabetic rats at 50, 100 & 200 mg/kg doses. The blood glucose level of experimental animals was determined at 0, 1, 3 and 5 hrs after treatment with aqueous extract using glucometer. Metformin HCl (120 mg/kg) was used as a reference standard. The preliminary phytochemical screening of the aqueous extract of leaves showed presence of carbohydrates, flavonoids, alkaloids, tannins etc. All the three doses of aqueous extract (50, 100 and 200 mg/kg) significantly reduced the blood glucose level at both 3rd and 5th hours of treatment in diabetic rats as compared to untreated diabetic control but the reduction was more significant at 5th hour. The percentage reduction in blood glucose level was found to be 35.6, 53.65 and 61.39 respectively and it was dose dependent. The aqueous extract at dose 200 mg/kg showed maximum percentage reduction (61.39) and the results were comparable with that of reference standard Metformin HCl (61.61%).

Index Terms - *Maytenus emarginata*, phytochemical screening, antidiabetic activity, Alloxan.

INTRODUCTION

Diabetes mellitus is a metabolic disorder typically characterised by hyperglycemia. It has become a serious threat to human health due to its various complications and increasing incidence in rural populations throughout the world. Various categories of synthetic drugs are available in modern medicine for its treatment but because of the inability of current therapies to control all of the pathological aspects of diabetes, there is need to find out alternatives.¹

In Indian culture medicinal plants have played an important role since Rigveda and the utility of medicinal plants is due to presence of various valuable phyto-constituents which varied therapeutic effects. A

large percentage of population of developing as well as developed countries rely on traditional medicines as the main source of medical care due to lack of availability of required medicines, high cost or personal preferences.^{2,3}

More than 1200 plant species reported to have been used to treat diabetes and/or investigated for antidiabetic activity. Still there are many more traditionally used plants which need to be investigated in a more systematic scientific manner so that valuable leads can be obtained for the development of alternative drugs.⁴

Celastraceae family is indigenous to tropical and subtropical regions of the world. The family constitutes approximately 88 genera and 1300 species of plant.⁵

One such plant from this family is *Maytenus emarginata* commonly known as Bharati in local language. It is an erect evergreen shrub; leaves are obovate in shape, glaucous green or reddish brown in colour and have emarginate apex and serrate margin.^{6,7}

The plant is reported to contain sesquiterpene pyridine alkaloids Emarginate A-E, β -amyrin, β -sitosterol. The leaves are reported to contain palmitic acid, maytensine and flavonoids like quercetin, myricetin, isorhamnetin etc.⁸

The roots are reported to be used in dysentery and the root juice is prescribed early in the morning for 10-15 days for the treatment of diabetes. Tender shoots are used for mouth ulcer.

The tender leaves are chewed raw in the treatment of jaundice. Pulverised leaves are given in milk to children as a vermifuge. Ash of leaves is used to heal sores and wounds.^{9,10}

The plant is also reported to be used in cancer therapy.¹¹

MATERIAL AND METHODS

1. Collection and authentication of plant material

Group Numbers	Treatment Groups
1.	Untreated Diabetic control
2.	120mg/kg reference standard Metformin HCl
3.	50mg/kg aqueous extract
4.	100mg/kg aqueous extract
5.	200mg/kg aqueous extract

Maytenusemarginata leaves were collected from Kamptee region, district Nagpur, Maharashtra, India and botanical identification of plant was done from Department of Botany, RTMNU, Nagpur whose Voucher specimen no. was 9532.

Preparation of Extract

M.emarginata leaves were thoroughly cleaned with distilled water, shade dried and pulverized into coarse powder. About 500g of dried powder was macerated with distilled water for one week and resulting extract was filtered. The filtrate was concentrated to dryness by rotatory vacuum evaporator. A solid light brown mass was obtained.

Solution of extract was prepared by using normal saline as solvent for administration to experimental animals.

Preliminary Phytochemical screening:

Preliminary phytochemical screening of aqueous extract was carried out by applying standard chemical tests to detect presence of various plant metabolites like alkaloids, glycosides, tannins, flavonoids, carbohydrates, proteins etc.^{12, 13}

Animals

Sprague Dawley rats (150-200 g) were used and kept at standard animal housing conditions of 12 hours light/dark cycle. They were used for studies after acclimatization period of 10 days in laboratory environmental conditions. Animals were fasted for 18 hours before experimentation but allowed free access to water. The experimental protocol has been approved by the IAEC (Institutional Animal Ethical Committee) having registration no. 853/AC/04/CPCSE/Dec 2009.

EXPERIMENTAL DESIGN

Alloxan induced diabetes model:

The rats were randomly divided in 5 groups with six in each group. Diabetes was induced by single intraperitoneal injection of Alloxan monohydrate (150mg/kg). The rats with moderate diabetes were used in the experiment.

Blood samples were withdrawn after treatment at 0, 1, 3 and 5 hours from tail vein of rats and analysed for blood glucose level using glucometer.^{14, 15 16.}

Statistical analysis:

All the results are given as mean ± SEM. Significance of differences between means was evaluated by one way analysis of variance (ANOVA) followed by Dennett's t-test. p values <0.05 were considered to be statistically significant.

RESULTS & DISCUSSION

Table 1: Preliminary Phytochemical Screening of aqueous extract of *M. emarginata* leaves

Sr. No.	Constituents	Results
1	Carbohydrates	+ve
2	Proteins	-ve
3	Alkaloids	+ve
4	Glycosides	+ve
5	Flavonoids	+ve
6	Tannins	+ve
7	Saponins	+ve

+ve indicates present, -ve indicates absent

Table 2: Anti diabetic effect of aqueous extract of *Maytenus emarginata* leaves in alloxan induced diabetic rats:

Sr. No.	Groups	Blood glucose level at hour (mg/dl)				% Reduction in blood glucose after 5 hr.
		0	1	3	5	
1	Untreated diabetic control	321.8 ±29.6	339.1 ±19.19	354.8 3±17.5	409.0 ±19.4	-
2	Metformin HCl (120 mg/kg)	274.8 ±20.4	197.5 ±21.9***	132.6 ±9.0**	105.5 ±3.5**	61.61
3	Aqueous extract of <i>M.emarginata</i> (50 mg/kg)	298.8 ±2.6	293.0 ±4.16	280.1 ±3.6**	192.8 0±5.1***	35.5
4	Aqueous extract of <i>M.emarginata</i> (100 mg/kg)	325.8 ±8.0	318.0 ±8.0	268.8 ±7.4**	151.0 ±4.2**	53.65
5	Aqueous extract of <i>M.emarginata</i> (200 mg/kg)	315±3.3	287.5 ±15.6	250±14.3**	121.6 ±4.7**	61.39

Values are given as mean \pm SEM (n=6), ***p<0.0001 compared with diabetic saline control group.

Phytochemical screening of aqueous extract of *M. emarginata* leaves showed the presence of alkaloids, glycosides, flavonoids, tannins, saponins, carbohydrates. (Table 1)

All the three doses (50, 100 and 200 mg/kg) of the aqueous extract of leaves more significantly reduced the elevated blood glucose level at 5th hour of treatment in alloxan induced diabetic rats as compared with diabetic control rats. The percentage reduction was found to be in dose related manner such as 35.3, 53.65 and 61.39 respectively. However, the maximum percentage reduction in blood glucose level was found with 200 mg/kg dose (61.39%) of the extract and the results were comparable with that of reference standard Metformin HCl (61.61%). (Table 2)

Various plant extracts and the isolated phytoconstituents are reported to be used for the treatment of diabetes. Many flavonoids related studies have indicated the benefits of natural flavonoids with hypoglycaemic effects and also their important role in the management of diabetic complications.^{17, 18, 19, 20, 21}

The aqueous extract of *M. emarginata* leaves was found to be very rich in flavonoids content so the antihyperglycemic effect of the extract may be attributed to their presence along with other constituents of the extract.

CONCLUSION

The aqueous extract of leaves of plant *Maytenus emarginata* possesses potential activity in decreasing the elevated blood glucose level. Further research is needed to isolate lead compounds from this extract to find the exact active constituent responsible for the anti-hyperglycaemic effect.

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