

ANTIDIABETIC ACTIVITY OF METHANOLIC EXTRACT OF *MEMECYLON MALABARICUM* (MELASTOMATACEAE) LEAVES

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Abstract

Memecylon malabaricum cogn (Melastomataceae) is an indigenous medicinal plant used in ethno medicine for the treatment of bacterial infections, inflammation and skin diseases including herpes, chickenpox. It's also a root ecboic. The methanolic extract of *Memecylon malabaricum* leaves is subjected to antidiabetic activity using experimental model of alloxan induced diabetes. The results showed that the methanolic extract significantly decrease the raised blood glucose level, comparable to reference standard, gliclazide. The results of this study explicate justification of the use of this plant in the treatment of diabetes.

Keywords: Antidiabetic activity, *Memecylon malabaricum*, leaves extract

1. Introduction

Diabetes mellitus (DM), often referred to simply as diabetes is a syndrome of disordered metabolism, usually due to a combination of hereditary and environmental causes, resulting in abnormally high blood sugar levels (hyperglycemia)¹. Diabetes develops due to a diminished production of insulin (in type 1) or resistance to its effects (in type 2 and gestational). Both lead to hyperglycemia, which largely causes the acute signs of diabetes: excessive urine production, resulting compensatory thirst and increased fluid intake, blurred vision, unexplained weight loss, lethargy, and changes in energy metabolism². Diabetes and its treatments can cause many complications. Acute complications (hypoglycemia, ketoacidosis, or nonketotic hyperosmolar coma) may occur if the disease is not adequately controlled. Serious long-term complications include cardiovascular disease (doubled risk), chronic renal failure, retinal damage (which can lead to blindness), nerve damage (of several kinds), and micro vascular damage, which may cause erectile dysfunction and poor wound healing. Poor healing of wounds, particularly of the feet, can lead to gangrene, and possibly to amputation³.

It is a major public health problem in the developed as well as developing countries. It is ranked seventh among the leading causes of death, and third when it's fatal complications are taken in to account⁴. Regions with greatest potential are Asia and Africa, where DM rates could rise to two to three-folds than the present rates. As per WHO report, approximately 150 million people have diabetes mellitus world wide, and this number may well double by the year 2025⁵. Several synthetic drugs such as biguanides and sulfonylureas are presently available to reduce hyperglycaemia in diabetes mellitus. These drugs have side effects and thus searching for a new class of compounds is essential to overcome these problems⁶. Many herbal medicines have been recommended for the treatment of diabetes. Traditional plant medicines are used throughout the world for a range of diabetic presentations. Thus the present investigation was carried out to evaluate the antidiabetic potential of *Memecylon malabaricum*, cogn. *Memecylon malabaricum*, cogn is a tree up to 5 m tall⁷, widely distributed in Western Ghats (Dakshina kannada and Udupi districts of Karnataka, Kerala, and Tamilnadu) of India, China, Srilanka, Asia, Africa, Australia, Madagascar, Pacific Islands, belongs to the family Melastomataceae^{8, 9, 10, 11}. *Memecylon* is genus of shrubs or small tree distributed through out the world. Up to this 300 species were identified^{12, 13}. The Melastomataceae family is a vast source of pharmacologically active tannins, flavonoids, alkaloids, resins, waiting for experimentation and observed for anti-microbial, anti-inflammatory, anti-HIV, anti-hypertensive, for treatment of skin disorders, diarrheal, bleeding, and scavenging of free radicals, inhibition of monoamine oxidase inhibitors (MAO-B), post partum invigoration and astringent activities^{8,9,10,11}.

Memecylon malabaricum has considerable reputation for its traditional use in the treatment of diabetes, various bacterial infections, inflammatory and skin disorders including herpes, chicken pox. It is also used as a root ecboic like ergot^{14, 15}. Although this herb has many useful claims, no specific scientific study has been carried out to examine the antidiabetic activity of the plant, that's why the current study was designed.

2. Material and methods

2. Experimental Animals: *Wistar albino* rats of either sex (200-250 g) procured from National Institute of Nutrition, Hyderabad, Andhra Pradesh, India, and were used to study the antidiabetic activity. The rats were randomly distributed into groups and housed in cages (5 per cage). The animals were maintained under standard laboratory conditions (light period of 12h/day and temperature 22 0C±20C), with free access to standard rodent pellet diet (Amrut, India) and water ad libitum. The experiment was cleared by Institutional Animal Ethical Committee.

2.2 Chemicals and Drugs: All the drugs used in this study were of Pharmaceutical grade. Alloxan monohydrate (Sigma chemicals, St. Louis, USA), Gliclazide (Wockhardt, Aurangabad, India), gum accacia (Sparchem, Maharastra, India), Blood Glucose kit (Dr.Reddy's Laboratories Ltd. Hyderabad, India) and methanol were supplied by Desai chemicals, Visakhapatnam, India.

2.3 Plant Material: Fresh leaves of *Memecylon malabaricum* were collected from Western Ghats of India in November 2008 and were authenticated from Prof. M. Venkaiah, Taxonomist, Department of Botany, Andhra University, Visakhapatnam, India. The leaves were shade dried at a temperature between 21-30⁰C for 15-30 days, after which these leaves were chopped and ground. Finally extraction was carried out by the following procedure

2.4 Preparation of the Extract: The powdered crude drug (700 g) was extracted with methanol in Soxhlet apparatus for 24 hours. The extract thus obtained was concentrated under vacuum (50⁰C) dried completely and weighed. The yield was found to be approximately 16% w/w.

2.5 Preliminary Phytochemical Analysis: Preliminary phytochemical analysis of *Memecylon malabaricum* was performed for alkaloids, tannins, saponins, terpenes, steroids, flavonoids and glycosides according to the Kokate et al., Table 01.

2.6 Antidiabetic Activity

2.6.1 Alloxan Induced diabetes¹⁶: Albino rats of either sex were fasted for 18h before injection with alloxan. Alloxan monohydrate was dissolved in saline. A dose of 100 mg/kg body weight injected immediately after preparation through intraperitoneal route.

Since alloxan is capable of producing fatal hypoglycaemia as a result of massive insulin release from the pancreas, animals were treated with 10% dextrose orally to combat the immediate hypoglycaemia. Blood sugar was measured after 24- 48 h of alloxan treatment to evaluate induction of diabetes.

2.6.2 Collection of Blood Samples: The animal was restrained (un anaesthetized) in such a way that loose skin of the neck was tightened while handling the head with the left hand. With the help of the index finger the eye was pressed just behind the angle of the jaw resulting in the engorgement of the retro orbital plexus. Then tip of the capillary was inserted at the medial canthus into the retro-orbital plexus with gentle rotation by the other hand. As the vessels are ruptured, blood wells up in the peri-orbital space. The tip of the capillary was then slightly withdrawn, so that the blood flows into the capillary, which was collected in micro centrifuge tube containing small quantity of potassium oxalate and sodium fluoride as anticoagulant. Blood samples were collected from retro-orbital plexus at 0, 1, 2, 4, 6, 8, 10, and 12 hour. Blood glucose levels were estimated by GOD-POD method.

2.6.3 Experimental set up: *The rats (with blood sugar levels between (250-350 mg/dl) were used for the experiment. Each group consisted of 6 animals (n=6).*

Group-I: Received vehicle (5% gum accacia) and served as control,

Group II: Received methanolic extract of *Memecylon malabaricum* 100 mg/k g, p.o

Group III: Received methanolic extract of *Memecylon malabaricum* 200 mg/k g, p.o

Group IV: Received methanolic extract of *Memecylon malabaricum* 400 mg/k g, p.o

Group V: Received a standard drug gliclazide 7.2 mg/kg (the human dose of gliclazide was converted into the animal dose using the standard dose-converting table¹⁷).

2.7 Statistical analysis

Results of the study were expressed as Mean \pm S.E.M. ANOVA followed by Dennett's test were used to determine significant differences between groups. P- Values less than 0.05 and 0.01 were considered as indicative of significance

3. Results

The antidiabetic activity of methanolic extract of *Memecylon malabaricum* leaves against alloxan induced diabetic rats was presented in table 02 and fig. 01. *Memecylon malabaricum* which showed antidiabetic activity and the results are comparable to that of Gliclazide. The extract at 400 mg/kg, p.o, showed maximum reduction of raised blood glucose level as that of 100 and 200 mg/kg. The results obtained indicates that the extract found to have significant ($P < 0.01$) antidiabetic activity in rats.

4. Discussion

The crude methanol extract showed presence of multiple chemical constituents with the presence of flavonoids, saponins, tannins. The extract showed dose dependent antidiabetic activity, which was found to be statistically significant at higher concentration in alloxan induced diabetes. However this activity was less potent as compared to Gliclazide.

Conclusion

Memecylon malabaricum extract possesses an antidiabetic activity. Further studies are required to identify the active fractions that are responsible for antidiabetic activity and to clarify mechanisms of their actions.

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Table 01:
Phytochemical Screening of Methanolic Extract of *Memecylon malabaricum* leaves

Name of the test	<i>Memecylon malabaricum</i>	
	Methanolic extract	Ethylacetate fraction
Phytosterols	+	+
Triterpenes	-	-
Glycosides	-	+
Saponins	+	-
Flavonoids	+	+
Tannins	+	-
Carbohydrates	-	+
Alkaloids	-	+

‘+’ Present ‘-’ Absent

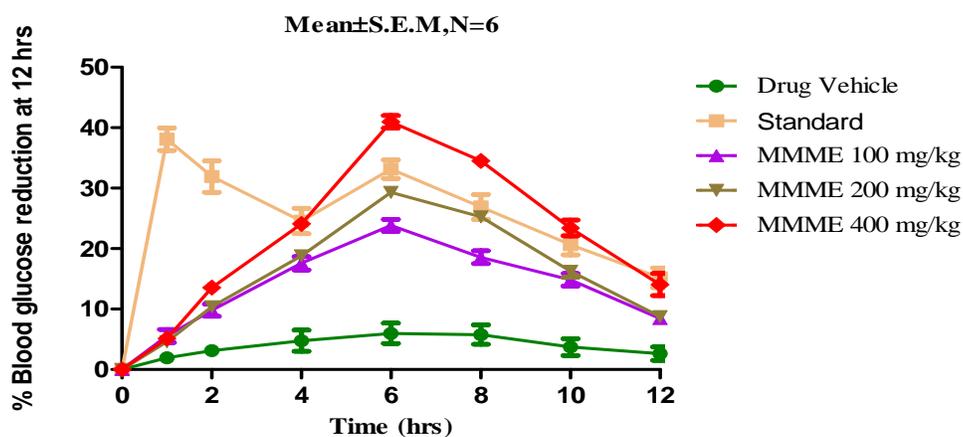
Table 02:
Effect of methanolic extract of leaves of *Memecylon malabaricum* on percentage blood glucose Reduction in Diabetic rats

Time (hrs)	Control	Standard 7.2 mg/kg	MMME 100 mg/kg	MMME 200 mg/kg	MMME 400 mg/kg
0	0	0	0	0	0
1	1.95±0.84	38.09±1.9***	5.55±1.08**	4.63±0.20*	5.16±0.4**
2	3.16±0.96	31.92±2.6***	9.82±1.03**	10.37±0.47*	13.55±0.3**
4	4.78±1.75	24.58±2.1***	17.59±1.11**	18.80±0.62*	24.11±0.8**
6	5.98±1.68	33.16±1.5***	23.85±0.98**	29.29±0.32*	40.97±1.1**
8	5.77±1.60	26.89±2.0***	18.56±1.06**	25.26±0.64*	34.54±0.3**
10	3.72±1.39	20.63±1.7***	14.85±1.05**	16.25±0.97*	23.41±1.3**
12	2.62±1.08	15.18±1.6***	8.43±0.89**	8.81±0.70*	14.05±1.8**

MMME = *Memecylon malabaricum* methanolic extract

Significance: *P<0.05, **P<0.01, ***P<0.001

Fig. 01: Dose dependent effect of methanolic extract of leaves of *Memecylon malabaricum* and gliclazide on percentage blood glucose reduction in alloxan induced diabetic rats



MMME = *Memecylon malabaricum* Methanolic extract