



## BLOOD GLUCOSE LOWERING POTENTIAL OF *Commiphora Caudata* (Wight & Arn) Engl IN ALLOXAN INDUCED DIABETIC RATS

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### ABSTRACT

The present investigation explores the blood glucose lowering potential of *Commiphora Caudata* (Wight & Arn) Engl extracts (ethyl acetate and methanol) in alloxan induced diabetic rats. Both the extracts caused highly significant reduction of (\*\*P < 0.001) blood glucose level, when compared with diabetic control as well as with glibenclamide at the end of 7<sup>th</sup> and 14<sup>th</sup> consecutive days by oral intubations. They also significantly reduced the TGL, HDL, VLDL, LDL and total cholesterol levels.

**Key words:** Antidiabetic activity, *Commiphora caudata*, Ethyl acetate extract, Methanolic extract, Alloxan

### INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder, characterized by hyperglycemia, which affects the metabolism of carbohydrates, fats and proteins. This metabolic disorder is associated with deficiency in insulin action<sup>1</sup>. A world wide survey reported that DM affects nearly 6% of world population. The number of people with DM will increase by 150% in the next 25 years and the reasons of this rise include a combination of sedentary life style, unhealthy dietary habits and genetic predisposition<sup>2,3</sup>. The control of DM normally involves exercise, diet and drug therapy. Because of the side effects of insulin and oral hypoglycemic agents, in the last years, there has been an increasing demand for natural products with anti-diabetic activity. Hence, search for natural antidiabetic products that possess established therapeutic efficacy and at the same time, devoid of side effects is justified. Therefore, an effort has been made to experimentally determine the antidiabetic activity of ethyl acetate and methanolic extracts of *Commiphora Caudata* (Wight & Arn) Engl.

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***Commiphora caudata* (Wight & Arn)<sup>4,5</sup>**

The genus *Commiphora* contains about 165 species of spiny balsamiferous trees and shrubs distributed in Africa and tropical Asia. Many of the species yield resins of commercial importance. About 5 species occur in India namely *commiphora berryi* (Arn), *commiphora caudata* (Wight & Arn), *commiphora mukul* (Hook.exstocks), and *commiphora roxburghii* (Arn), of which *commiphora mukul* and *commiphora roxburghii* yield Indian Bdellium, a gum resin, obtained by incision of the bark, which is largely used as incense, as a fixative in perfumery, and as a substitute for African Bdellium. It is also a common adulterant of Myrrh. The plant *Commiphora caudata* (family: Burseraceae) is a shrub and it is claimed to possess astringent, sweet, cooling, aphrodisiac, diuretic and antidiabetic activities. It is used for fever, strangury, vitiated conditions of vata and pitta in siddha systems of medicine. The leaves are useful in rheumatism. It was reported to contain tannins, carbohydrates and oleo-gum resin.

**EXPERIMENTAL****Materials and methods**

The entire parts of plant (including roots) were collected from Vasudevanallur, Tirunelveli, India during the month of February 2006 and identified by a botanist of Government Siddha Medical College, Palayamkottai, Tirunelveli. The plant was dried in shade for 6 days and coarsely powdered. Solvents ethyl acetate and methanol were AR grade obtained from SD Fine Chemicals, Mumbai, India.

**Method****Extraction<sup>6</sup>**

The coarsely powdered material was extracted separately with ethyl acetate and methanol by Soxhlation for six hours and concentrated in a rotary evaporator. A green colored residue and dark green colored residue were obtained in ethyl acetate extraction and methanol extraction, respectively. The yields of the extracts were 8.10 %w/w and 10.80 % w/w, respectively.

At the end of 7<sup>th</sup> and 14<sup>th</sup> day, plasma levels were estimated using the glucose oxidase method. The results were analysed by ANOVA.

**Antidiabetic activity<sup>7,8</sup>**

Male wistar rats (150-200 g) were used, with food and water ad libitum. Twelve

hours before the experiments, they were transferred to the laboratory and maintained with water ad libitum only. The experiments were approved by the Institutional Animal Ethics Committee, Rajah Muthiah Medical College, Annamalai University.

Hyperglycaemia was induced by a single intra peritoneal injection of freshly prepared aqueous solution of alloxan monohydrate (SD Fine Chemicals, Mumbai) 150 mg/kg, to overnight fasted rats. Control rats received normal saline (2 mL/kg body weight) alone. Animals did not develop hyperglycaemia after 480 hr of alloxan injection were rejected and new animals were used. Immediately after confirmation of diabetes, fasting blood glucose level > 200 mg/dL, rats were classified into five groups of six rats each.

**Group I (Normal control)** treated with normal saline 2 mL/kg body weight and served as normal control.

**Group II (Diabetic control)** treated with alloxan mono hydrate 150 mg/kg and served as diabetic control.

**Group III (Ethyl acetate extract treated)** treated with ethyl acetate extract 200 mg/kg by oral intubation.

**Group IV (Methanol extract treated)** treated with methanolic extract 200 mg/kg by oral intubation.

**Group V (Reference standard)** treated with glibenclamide 10 mg/kg by oral intubation and served as reference standard.

Before the treatment (0 day) and at the end of 7<sup>th</sup> and 14<sup>th</sup> day, plasma levels were estimated using the glucose oxidase method. Apart from measuring the blood glucose level, TGL, HDL, VLDL, LDL, and total cholesterol levels in plasma were also calculated.

### Statistical analysis<sup>9</sup>

Results were expressed as mean  $\pm$  S.E.M. Data were statistically analysed by ANOVA with level of significance \*\*p < 0.001.

## RESULTS AND DISCUSSION

The antidiabetic activity of ethyl acetate and methanolic extracts of *Commiphora Caudata* was observed at the end of 7<sup>th</sup> and 14<sup>th</sup> day (Table 1) (Fig. 1). After daily treatment with the extracts (ethyl acetate and methanol) 200 mg/kg led to dose dependent fall in blood

sugar levels. At the end of 7<sup>th</sup> and 14<sup>th</sup> day, the blood glucose level of ethyl acetate and methanolic treated groups were  $173.23 \pm 3.1$ ,  $112.56 \pm 3.03$  and  $115.45 \pm 1.7$ ,  $95.6 \pm 1.19$ , respectively. Glibenclamide (10 mg/kg) displayed a maximum decrease in blood glucose level after the same period i.e.  $112 \pm 1.42$  and  $94.41 \pm 1.81$ . From the above results, it is clearly indicated that both the extracts reduced the blood sugar level in a highly significant way  $**p < 0.001$ , when compared with diabetic control as well as with glibenclamide but not better than glibenclamide. Among the two extracts, methanolic extract showed better antidiabetic activity than that of ethyl acetate extract due to its better reduction in blood glucose level.

**Table 1: Anti diabetic activity of different extracts of *commiphora caudate***

S. No.	Groups	Dose	Blood glucose level Treatment days		
			0 day	7 <sup>th</sup> day	14 <sup>th</sup> day
I.	Normal control.	Normal saline 2 mL/kg.	$87.03 \pm 2.31$	$86.4 \pm 1.59$	$86.36 \pm 3.50$
II.	Diabetic control.	Alloxan 150 mg/kg.	$256.03 \pm 3.1$ b <sup>NS</sup>	$262.98 \pm 3.37$ b <sup>**</sup>	$265.58 \pm 1.76$ b <sup>**</sup>
III.	Ethyl acetate extract treated.	200 mg/kg.	$267 \pm 8.56$ a <sup>NS</sup> b <sup>NS</sup>	$173.23 \pm 3.1$ a <sup>**</sup> b <sup>**</sup>	$112.56 \pm 3.03$ a <sup>**</sup> b <sup>**</sup>
IV.	Methanol extract treated.	200 mg/kg.	$260.75 \pm 3.23$ a <sup>NS</sup> b <sup>NS</sup>	$115.45 \pm 1.7$ a <sup>**</sup> b <sup>**</sup>	$95.6 \pm 1.19$ a <sup>**</sup> b <sup>**</sup>
V.	Reference standard. Glibenclamide	10 mg/kg.	$264.4 \pm 2.33$ a <sup>NS</sup>	$112 \pm 1.42$ a <sup>**</sup>	$94.4 \pm 1.81$ a <sup>**</sup>

Values are mean  $\pm$  SE of 6 rats.  $**p < 0.001$  compared with diabetic control by ANOVA.  
a = Group II compared with III, IV and V. NS: Non significant.  
b = Group V compared with II, III and IV

From the Table 1 (Fig. 2) results revealed that both the extracts reduced the total lipids as well as total cholesterol levels in a highly significant manner.

It is known that lowering of the plasma glucose level may be induced by the release of insulin, an endogenous peptide involved in the regulation of blood sugar. However, the

activity of insulin is considered negligible in alloxan – induced diabetic rats. Alloxan treatment damages the insulin- secreting beta cells, which are the cells located in the pancreas responsible for secreting insulin. The destruction of these beta cells caused persistent hyperglycaemia and therefore, mimics insulin- dependent diabetes mellitus (IDDM)<sup>10</sup>. Also, a sulfonylurea urea derivatives, such as glibenclamide, is the most widely used drug for the treatment of type 2 diabetes. They stimulate insulin secretion from pancreatic islet  $\beta$  cells by blocking ATP-ase sensitive potassium channels, causing cell membrane to depolarise leading to calcium influx and resulting in insulin release<sup>11</sup>.

**Table 2: Effect of different extracts on lipid profile and total cholesterol levels**

Groups	Treatment	TGL mg/dL	HDL mg/dL	VLDL mg/dL	LDL mg/dL	Total cholesterol
I	Control. (normal saline 2 mL/kg)	71.5 $\pm$ 0.94	26.31 $\pm$ 0.61	14.1 $\pm$ 0.39	44.05 $\pm$ 0.69	87.08 $\pm$ 1.35
II	Diabetic control. Alloxan 50 mg/kg.	115.11 $\pm$ 0.91 b**	72.67 $\pm$ 2.11 b**	25.11 $\pm$ 0.31 b**	170.88 $\pm$ 2.95 b**	213.66 $\pm$ 1.96 b**
III	Ethyl acetate extract 200 mg/kg.	109.18 $\pm$ 2.07 a**b**	44.5 $\pm$ 1.14 a**b**	21.71 $\pm$ 0.69 a**b**	69.61 $\pm$ 0.89 a**b**	133.9 $\pm$ 3.42 a**b**
IV	Methanol extract 200 mg/kg.	97.58 $\pm$ 1.10 a**b**	35.55 $\pm$ 0.53 a**b**	20.03 $\pm$ 0.31 a**b**	52.06 $\pm$ 0.74 a**b**	112.71 $\pm$ 2.02 a**b**
V	Glibenclamide 10 mg/kg.	86.03 $\pm$ 1.04 a**	30.4 $\pm$ 1.35 a**	16.35 $\pm$ 0.62 a**	43.65 $\pm$ 0.67 a**	94.23 $\pm$ 1.97 a**

Values are mean  $\pm$  SE of 6 rats. \*\*p < 0.001 compared with diabetic control by ANOVA.

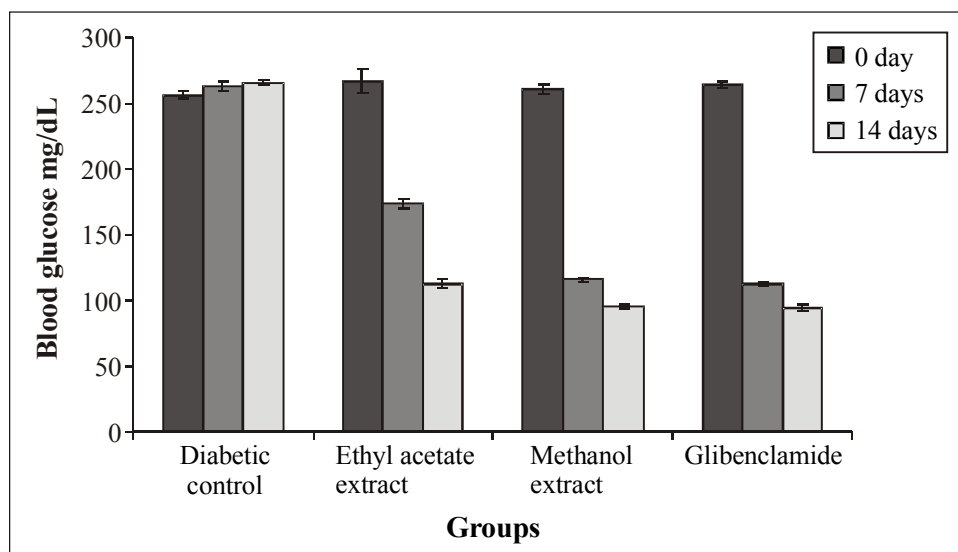
a = Group II compared with III, IV and V.

NS: Non significant.

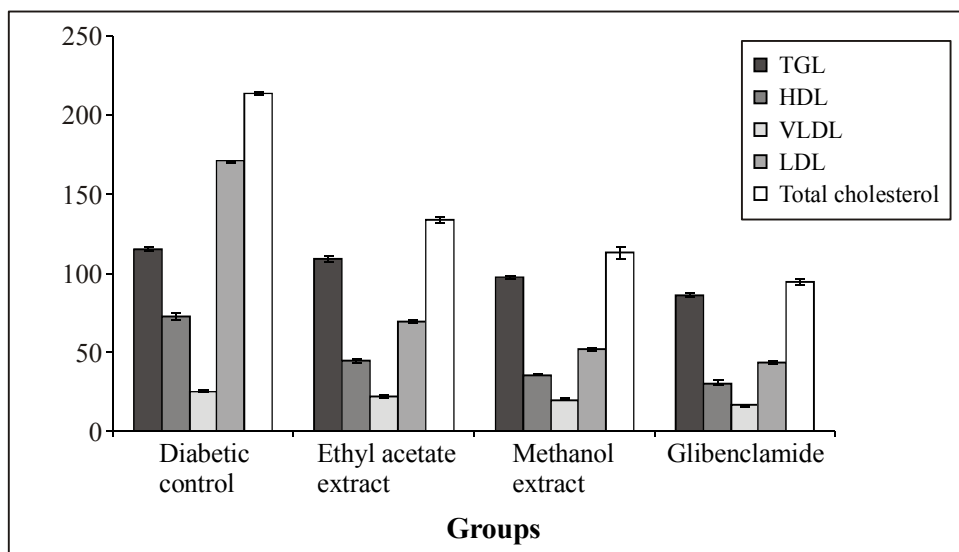
b = Group V compared with II, III and IV

Preliminary phytochemical screening of both the extracts showed the presence of flavonoids. Many biological activities have been described for flavonoids including antioxidant<sup>12</sup> and trypanocidal<sup>13</sup> activities. Moreover, it has been reported that some flavonoids exhibit hypoglycaemic activity in normal and alloxanized rats<sup>14</sup>. Hypoglycemic activity of ethyl acetate and methanolic extracts of *Commiphora caudata* may be due to the

presence of flavonoids. In this way, results of present study support the claim for antidiabetic effect of ethyl acetate and methanolic extracts of *Commiphora Caudata*.



**Fig. 1: Antidiabetic activity of different extracts of *commiphora caudata***



**Fig. 2: Effect of different extracts on lipid profile and total cholesterol level**

To the best of our knowledge, this is the first report on the hypoglycemic action of *Commiphora caudata*.

Further studies are required to disclose the mechanism of the hypoglycemic action as well as for antihyperlipidemic action of *Commiphora caudata*.

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Accepted : 11.10.2009