

Research Article

## Antidiabetic Potential of *Murraya koenigii* Roots in Alloxan-Induced Diabetic Rats

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### ABSTRACT

The plant *Murraya koenigii* (Linn.) Spreng. (Family Rutaceae) commonly known as curry leaf plant or Indian curry leaf plant is a highly valued plant for its characteristic aroma and medicinal properties. In the present study the alcoholic and aqueous extracts of *Murraya koenigii* roots at dose of 200 mg/kg and 400 mg/kg for 21 days have been taken to evaluate the hypoglycemic activity in alloxan induced diabetic rats. The aqueous extract at 400mg/kg dose level exhibited maximum fall of 57.76% in fasting blood glucose (FBG) of rats after 21 days treatment. The findings from this study suggest that the aqueous extract of the roots may be prescribed as adjunct to dietary therapy and drug treatment for controlling diabetes mellitus.

**Keywords:** *Murraya koenigii*; Hypoglycemic; Alloxan induced diabetic Rats.

### INTRODUCTION

Diabetes is the world's largest endocrine disease. According to WHO projection, the prevalence of diabetes is likely to increase by 35%. Recent estimates indicate there were 171 million diabetics worldwide in the year 2000 and this would increase to 366 million by the year 2030<sup>1</sup>. Currently available therapies include insulin and various synthetic antidiabetic agents like sulfonylureas, biguanides and  $\alpha$ -glucosidase inhibitors but these agents can produce side effects and sometimes not recommended in conditions like pregnancy. Therefore it is necessary to look for new solution to manage this health problem.

*Murraya koenigii* (L.) Spreng. (Family: Rutaceae) is commonly known as "curry patta" in Hindi and is widely and regularly used as a spice and a condiment in India and other tropical countries<sup>2,3</sup>. Traditionally leaves and roots of the plant are stomachic, carminative, stimulant, anti-diarrhoeal, anti-dysenteric, anti-emetic, bitter, acrid, cooling, analgesic, antipyretic; used in leucoderma, blood disorders, to cure piles, skin eruptions and the bites of poisonous animals<sup>4,5</sup>. It has been reported that the leaves of *Murraya koenigii* are effective against diabetes<sup>6,7</sup>. The feeding of diet containing various doses of curry leaves (5, 10 and 15%) to normal rats for 7 days as well as mild diabetic and moderate diabetic rats for 5 weeks has shown varying hypoglycemic and anti-hyperglycemic effect<sup>8</sup>. Aqueous extract of leaves of *Murraya koenigii* at a dose of 300 mg/kg has been proved to be helpful in reduction of fasting blood glucose levels, total cholesterol, LDL, VLDL, SGOT, SGPT, serum alkaline phosphatase, serum creatinine and urinary sugar and an

increase in HDL, haemoglobin levels<sup>9,10</sup>. The plant contains alkaloids<sup>11</sup>, glycosides, flavonoids, minerals and volatile oil. The root bark contains monomeric and binary carbazole<sup>12</sup>, quinones, mukoene A, B and C, murrastifoline F, bis-2-hydroxy-3-methyl-carbazole, bismahanine, biskoenequinone A, and bismurrayquinone A along with murrayanine, murrayastine, murrayatine, murrayacine and murrayazolinol<sup>3</sup>. Although it has been already reported that the leaves extracts of *Murraya koenigii* possess the anti-hyperglycemic activity but no report was found on the roots of the plant so the present study was undertaken to evaluate the hypoglycemic effect of aqueous and alcoholic extracts of *Murraya koenigii* roots in alloxan-induced diabetic rats.

### MATERIALS AND METHODS

I. Plant Collection and Extraction: The plant material *Murraya koenigii* (L.) Sprengel was collected from healthy plants in Ambala and identified at National Institute of Science Communication and Information Resources (NISCAIR), New Delhi, under voucher specimen number NISCAIR/RHMD/Consult/-2008-09/1079/110. The dried and powdered roots were extracted successively with ethanol (RFCL, Mumbai, India) and water. The ethanol and aqueous extracts were concentrated. II. Animals: Healthy albino wistar strain rats of either sex (150-200 gm) were used for the studies. Throughout the experimental period, the animals were housed in colony cages under standard laboratory conditions of temperature (20 to 25 °C), humidity (50-60%) and 12 h light and 12h dark cycle. The animals were provided with food (Golden

Table 1: Effect of Extracts of *Murraya koenigii* (L.) Spreng. on Fasting Blood Glucose in Alloxan-induced Diabetic Rats

S. No.	Group	Blood Glucose Levels (mg/dl)			
		Day 0	Day 7	Day 14	Day 21
1	Normal control	89.66±1.406	89.0±1.366	91.3±2.667	90.17±3.833
2	Diabetic control	273.66±1.838	282.83±1.493	292.66±2.654	298.66±2.848
3	Standard (50 mg/kg/day)	269.0±1.653	147.33±2.390*	115.83±1.778*	110.33±2.431*
4	Aqueous (mg/kg/day)	200 271.0±1.612	167.5±2.045	143.83±3.240	133.17±1.851
5	Aqueous (mg/kg/day)	400 277.66±2.155	157.66±2.076*	120.83±2.023*	117.3±1.978*
6	Alcoholic 200(mg/kg/day)	271.83±1.447	196.66±2.011	181.66±3.694	171.33±3.756
7	Alcoholic 400(mg/kg/day)	269.33±1.820	162.83±2.151	137.0±4.033	122.33±1.585

Values are expressed in mean ± S.E.M., n=6, \* Significant at  $p < 0.05$ , Dunnet's test,

Table 2: Percentage Change in Fasting Blood Glucose Levels of Alloxan-induced Diabetic Rats

S. No.	Group	Day 7	Day 14	Day 21
1	Normal control	-0.73	+1.86	+0.56
2	Diabetic control	+3.35	+6.94	+9.13
3	Standard 50 (mg/kg/day)	-45.24	-56.95	-58.99
4	Aqueous 200 (mg/kg/day)	-38.19	-46.92	-50.84
5	Aqueous 400 (mg/kg/day)	-43.21	-56.48	-57.76
6	Alcoholic 200 (mg/kg/day)	-27.63	-33.17	-36.97
7	Alcoholic 400 (mg/kg/day)	-39.54	-49.13	-54.58

feed, Delhi) and water *ad libitum*. Approval was taken from the Institutional Animal Ethical Committee (IAEC) of Hindu College of Pharmacy, Sonapat, India under Regn. No. – 585/02/CPCSEA/07-HPS-76.

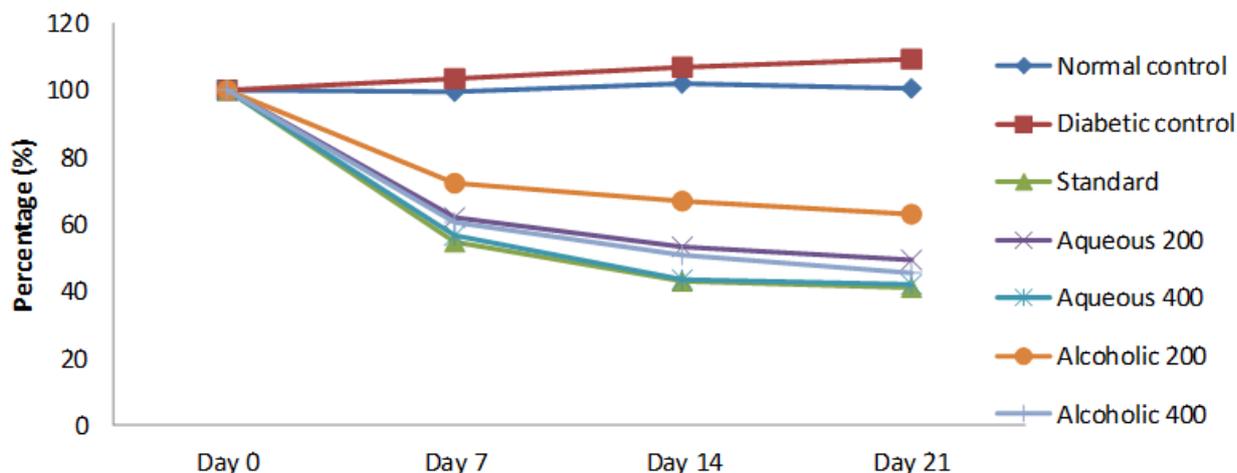
III. Hypoglycemic activity: Diabetes was induced by single intraperitoneal injection of freshly prepared solution of alloxan monohydrate (C.D.H. Pvt Ltd., New Delhi, India) (150mg/kg body weight) in normal saline to overnight fasted rats, blood samples were collected retro-orbitally from inner canthus of eyes using Micro

Hematocrit Capillaries, after at least 12 h of fasted animals. Glucose levels were estimated using Glucose Oxidase method<sup>13</sup> and the animals having marked hyperglycemia (Fasting blood glucose > 250 mg/dl) were selected for the study. Metformin (received as a generous gift from Ranbaxy Labs. Gurgaon, India) was used as the standard drug.

The experiment was carried on seven groups of six rats each and treated orally as follows:

Group I: Normal control: given only vehicle (distilled water)

## Percentage change in Blood Glucose Vs Time



**Graph 1. : Percentage Change in Fasting Blood Glucose Levels of Alloxan-induced Diabetic Rats**

Group II: Diabetic control: Diabetic given only vehicle (distilled water)

Group III: Diabetic treated with Metformin (50 mg/kg/day)

Group IV: Diabetic treated with aqueous extract (200 mg/kg/day)

Group V: Diabetic treated with aqueous extract (400 mg/kg/day)

Group VI: Diabetic treated with alcoholic extract (200 mg/kg/day)

Group VII: Diabetic treated with alcoholic extract (400 mg/kg/day)

Blood samples were collected from retro orbital plexus. Fasting blood glucose levels were estimated on 0, 7<sup>th</sup>, 14<sup>th</sup> and 21<sup>st</sup> day of experiment using Glucose Oxidase method.

### STATISTICAL ANALYSIS

The data are expressed as mean  $\pm$  standard error mean (SEM). Statistical comparisons were performed by one-way analysis of variance (ANOVA) followed by Dunnet's test. The results having  $p < 0.05$  were considered statistically significant.

### RESULTS AND DISCUSSION

Both the extracts exhibited significant reduction of blood glucose level in a dose dependent manner (Table.1, Graph. 1). Fasting blood glucose levels of normal healthy rats are in normal range. In case of control diabetic rats, FBG levels continued to rise during the experiment. In case of treated diabetic rats there was a maximal decrease of 57.76% in FBG levels of rats in the group treated with

aqueous extract (400 mg/kg) followed by 54.58% in group receiving alcoholic extract (400 mg/kg), 50.84% in group treated with aqueous extract (200 mg/kg) and 36.97% in group treated with alcoholic extract (200 mg/kg) (Table 2). The present investigations show that the root extracts of *Murraya koenigii* are effective in controlling the increased blood sugar levels. Alloxan induce hyperglycemia by selective cytotoxic effects on pancreatic  $\beta$  cells the extracts of the plant probably inhibited the destruction of  $\beta$  cells of islets of pancreas. The activity continued to increase with increase in dose as well as the duration. It also shows that the continuous use of the extracts or the accidental overdose will not result in the hypoglycemic shock. In this way it will be a better drug when taken in excessive dose for a longer duration. In conclusions, this study shows significant antidiabetic activity of *Murraya koenigii* roots. However, it will be interesting to isolate the compounds responsible for antidiabetic activity and to elucidate their mechanism of action.

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