

# Hypoglycemic Effects of Turmeric (*Curcuma Longa* Linn) on Bio-chemical Profile in Alloxan Monohydrate Induced Type-1 Diabetes in Albino Rats

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## Abstract

From time immemorial therapeutic potential of *Curcuma longa* linn is known. In present study an effort has been made to assess the hypoglycemic, anticholesteromic, anti-ureatic, anti-creatinic and Oral Glucose Tolerance Test (OGTT) activity of *Curcuma longa* juice in alloxan monohydrate induced experimental animal model. Rats were acclimatized for 7 days in lab temperature. All animals were given standard water and pellet diet. Diabetes was induced in rats with the help of alloxan monohydrate. After alloxan monohydrate injection rats were separated and treatment started with *Curcuma longa* juice and insulin. A marked rise in fasting blood glucose, serum cholesterol, serum creatinine, serum urea level were observed in diabetic control rats when compared to normal control rats. Anti-hyperglycemic, anti-cholesteromic, anti-creatinic, anti-ureatic activity observed in *Curcuma longa* fresh root juice administered rats on 10<sup>th</sup>, 20<sup>th</sup>, 30<sup>th</sup> and 40<sup>th</sup> days post treatment. Anti-hyperglycemic, anti-cholesteromic, anti-ureatic, anti-creatinic activity was found almost similar effective like insulin treatment group. It is hope that present investigation will be helpful in establishing a scientific basis for anti-diabetic, anti-cholesteromic, anti-creatinic, anti-ureatic effects in experimental animal model. The results are statistically significant.

**Keywords:** Diabetes • Blood Glucose • Insulin • Serum • Urea • Creatinin

## Introduction

Diabetes Mellitus is a life style associated disease that affect the entire human physiology. Diabetes is a endocrine disorder that creat homeostatic chos. If a person take high calorie diet and prefer sedendary life style, they are prone to pre-diabetics and utimetely leads to diabetic. If a person prefer sedendary life style, than his /her insulin receptors binds to fats, therefore insulin doesn't bind to own reseptors. Therefore cells are strive , and starts breakdown of own fats lead to ketoacidosis [1]. So change their life style to prevent the diabetes. In actually, diabetes mellitus is a metabolic alteration of multiple etiologies caused by hyperglycemia . Increased blood glucose causes disturbances of Carbohydrate, protein and lipid metabolism resulting from defects in insulin secretion or insulin action or both. Recently India has undergone rapid urbanization and industrialization resulting into remarkable changes in the life style of people. Most urban people lead a sedendary life, consume tobacco and take high calorie diet. In spite of tremendous advancement in the field of medical sciences, incidence of diabetes mellitus is continuously increasing due to consuming high calorie diet with lack of physical activity and excess stress. Type-2 diabetes increasing globally. 7 million people suffering from diabetes and after eleven years total number of diabetes has double to 62. Several oral and injectable anti-diabetic drugs are used in treatment of diabetes (2). The existing group of oral hypoglycemic drugs includes Sulphonylures, Biguanide alpha-glucosidase inhibitor, glucagon like peptide analogs, Dipeptidyl peptidase-4 inhibitors, agonist etc are in use. Recently inhibitors, Aldolase reductase inhibitors, agonists of fibroblast growth factors

are being explored. Several side effects associated with the use of such oral or injectable hypoglycemic agent during or after treatment have been reported. But no any side effect associated with the use of herbal drugs There is growing interest in herbal remedies for diabetes, due to their availability and lesser side effects. Gradually increasing order of this disease effect the society, for that medical sciences is busy to search some positive technology by which this abnormality can be deleted. Diabetes have very serious effect on the health. In addition consequence of abnormal metabolism (eg. lipogenesis, glycosylation of protein)In last few years there has been an exponential growth in the field of herbal medicine. These drugs are gaining popularity both in developing and developed countries because of their natural origin and less side effects. Many traditional medicines in use are derived from medicinal plants, minerals and organic matter. A number of medicinal plants traditionally used for over 1000 years named rasayana and present in herbal preparations of Indian traditional health care system. In Indian system of medicine most practiced formulate their own treatment (3-5). The World Health Organization (WHO) has listed 21,000 plants, which are used for medicinal purposes around the world. Among these 2500 species are in India, out of which 150 species are used commercially on fairly large scale. India is the largest producer of medicinal herbs. A number of clinical studies have been carried out in recent years that shows potential links between herbal therapies and improved blood glucose levels. Medicinal plant based industries in developing countries has been lack of information on the social and economic benifits that could be derived from industrialization utilization of medicinal plants. Plants are being used as food, vegetables, cosmetic and medicinal purposes. Medicinal plants have a grate role in treatment of various diseases. Dietary agents such as spices have been used extensively in the Eastern world for a variety of ailments for millennia, and five centuries ago they took a golden journey to the Western world. Various spice-derived neutraceuticals including 1-acetoxychavico acetate, anethole, capsaicin, cardamonin, Curcumin, dibenzoylthane, diosgenine, eugenol, gambogicacid, gingerol, thymoquinone, ursolic cid, xanthohumol andzermbone derived from galangal, anise, red chili, black cardamom, turmeric, licorice, fenugreek, clove, kokum, ginger, black cumin, rosemary, hop and panecone ginger have been investigated. Although , they always been used to improve to taste and color and as a preservative, they are also used in the treatme nt of Diabetes Mellitus , but non of them could be developed as a drug for diabetics. *Curcuma longa* L. (Zingiberaceae), commonly known as turmeric, is native to Southwest India . *Curcuma longa* generally used in treatement of indigestion , cough, arthritis, diabetes, blood purifier, menstrual irregularities and anti-oxidant. Present investigation was conducted to evaluate the anti-diabetic, anti-cholesteromic, anti-ureatic and anti-creatinic properties in alloxan monohydrate administered animals model.

## Materials and Methods

### Plant materials

The Turmeric (*Curcuma longa* Linn.) juice used for present investigation. Turmeric fresh root was obtained from the local crop field of Darbhanga, India.

### Juice of *Curcuma longa*

Firstly , *Curcuma longa* root was procured from crop field area and was cleaned and extracted the juice. Albino rats were used as experimental animals. Animals were procured from local supplier of Darbhanga, India. The rats were acclimatized for 7 days. All the animals were fed with rodent pellet diet Water was allowed adlibitum under strict hygienic condition (6).

### Induction of diabetes

Alloxan Monohydrate is a toxic glucose analogue which selectively destroys insulin producing cell in pancreas. This causes insulin dependent diabetes mellitus called "Alloxan Diabetes"<sup>5</sup>. Alloxan monohydrate was obtained from Explicit Chemicals Pvt. Ltd, Pune, India. The diabetes was induced in 12 hours fasted animal by a single intraperitoneal injection of freshly prepared solution of Alloxan monohydrate in 0.5 ml normal saline water. After 72hours of Alloxan monohydrate injection, the diabetic rats (blood glucose levels<290mg/dl) were separated. Treatment was started except in normal control and diabetic control animals. During further investigation all experimental group animals were given standared hygienic water and pellet diet.

## Experimental design

Group A-Normal Control (Normal rats)

Group B-Diabetic control (Alloxan treated rats)

Group C-Alloxan +*Curcuma longa* Juice treatment

Group D-Alloxan+Insulin Treatment

## Results and Discussion

A significant rise in fasting blood glucose levels was recorded in diabetic control when compared to normal control rats. Anti-diabetic, anticholesterolemic, anti-ureatic, anti-creatinic activity was recorded in *Curcuma longa* juice treated rats on 10th, 20th, 30th and 40th day post treatment. The serum cholesterol, Serum urea and serum creatinine of diabetic control animals were higher than other experimental group. Anticholesterolemic, antiureatic, and anti-creatinic activity were recorded in juice and insulin administered animals. Oral glucose tolerance test were significantly tolerated administered glucose in juice treated animals compared to diabetic control group. Turmeric also improves the serum protein count when compared to diabetic control rats. The results are shown in Tables 1-3.

**Table 1:** Effect of *curcuma longa* juice and insulin on blood glucose level in experimental animal model.

Experimental group	Fasting blood glucose level (mg/dl)			
	10 <sup>th</sup> Day	20 <sup>th</sup> Day	30 <sup>th</sup> Day	40 <sup>th</sup> Day
Group A-Normal rats	87.18 ± 2.83	88.18 ± 1.22	86.12 ± 1.38	85.19 ± 1.02
Group B-Diabetic control (vehicle)	298 ± 1.71	305.12 ± 2.12	306.22 ± 3.16	299.14 ± 0.87
Group C-Alloxan+ Juice treatment (1200mg/kg body weight)	280.17 ± 0.67 P<0.05	210.72 ± 2.12 P<0.05	180.17 ± 2.18 p<0.05	95.17 ± 2.16 p<0.05
Group D-Alloxan + Insulin (Human mixtard®)	279.18 ± 1.67 P<0.05	209.18 ± 3.14 P<0.05	182.16 ± 2.19 P<0.05	94.16 ± 0.18 P<0.05

Value are meant ± SEMN=6 P<0.05

**Table 2:** Effect of *curcuma longa* Juice and Insulin on biochemical profile in experimental animal model.

Experimental group	Fasting blood glucose level (mg/dl)				
	0 Minutes	30 Minutes	60 Minutes	90 Minutes	120 Minutes
Group A-Normal rats	92.60 ± 2.60	190.18 ± 4.01	145.02 ± 2.08	110.20 ± 4.60	96.20 ± 2.20
Group B-Diabetic control (vehicle)	295.18 ± 7.6	330 ± 1.60	360 ± 1.20	340 ± 2.12	320.40 ± 2.20
Group C-Alloxan+ Juice treatment (1200mg/kg body weight)	95.06 ± 6.28 P<0.05	209.18 ± 2.14 P<0.05	136.17 ± 3.12 p<0.05	132.18 ± 3.68 p<0.05	95.20 ± 3.60 p<0.05
Group D-Alloxan + insulin (Human mixtard®)	109.06 ± 2.07 P<0.05	240.26 ± 4.12 P<0.05	209.18 ± 2.18 P<0.05	116 ± 3.12 P<0.05	119.7 ± 2.19 P<0.05

Value are meant ± SEM,N=6 P<0.05.

**Table 3:** Effect of *curcuma longa* juice on Oral Glucose Tolerance Test (OGTT) in experimental diabetic albino rats.

Experimental group	Serum urea (mg/dl)	Serum creatinine (mg/dl)	Serum cholesterol (mg/dl)	Serum proteion (mg/dl)
Group A-Normal rats	34.01 ± 1.18	0.46 ± 0.09	100.42 ± 1.07	7.18 ± 0.18

Group B-Diabetic control (vehicle)	72.18 ± 3.08	1.68 ± 0.07	205.02 ± 2.86	4.87 ± 0.60
Group D-Alloxan + insulin (Human mixtard®)	35.15 ± 2.16 P<0.05	0.62 ± 0.07 P<0.05	107.03 ± 3.05 P<0.05	7.01 ± 0.03 P<0.05
Group C-Alloxan+ juice treatment (1200mg/kg body weight)	33.14 ± 1.19 P<0.05	0.55 ± 0.06 P<0.05	105.02 ± 2.07 p<0.05	8.20 ± 0.08 p<0.05

Value are meant ± SEMN=6 P<0.05.

*Curcuma longa* fresh root juice was found almost similar effect like insulin treatment group. The result of the present investigation indicate that glucose, serum creatinine and serum urea levels. Alloxan monohydrate facilitates the production of free radicals and causes the tissue damage. The beta cells of pancreas are susceptible to such damage. It appears from the present investigation that the *Curcuma longa* fresh root juice might have tissue repairable and restorative capacities. Kumar has also reported beet root juice treated rat shows reduction of blood glucose in alloxan monohydrate induced diabetic rats. Finding in this regard with *Curcuma longa* fresh root juice and beet root juice were also no different. It has reported that oral administration of aqueous extract of *Curcuma longa* root lead to marked lowering of blood glucose level in alloxan induced experimental model. Mohammad have also demonstrated that crude aqueous extract of *Curcuma longa* fresh root possess hypoglycemic properties in Alloxan administered animal model. Findings in the present study too are in accord with the findings discussed above, *Curcuma longa* fresh root juice has been widely used for curing various maladies. Present investigation will be helpful in establishing a scientific basis for anti-diabetic, anti-cholesterolemic, anti-ureatic, anti-creatinic uses of *Curcuma longa* fresh root juice in alloxan induced experimental animal model. *Curcuma longa* fresh root juice tolerated the overdose of glucose through oral glucose tolerance test in juice treated experimental animals. However, much more studies are still required to explore the other potential of this fresh plant root.

## Conclusion

The cost of treatment is already running many families in ruler India. This research appears that *Curcuma longa* works as anti-diabetic agent. We got the unbelievable positive effects of *Curcuma longa* fresh root juce on experimental diabetic animals. So this turmeric root will be helpful in treating the diabetes in ruler India due to low cost, easily availability and lesser side effects associated with the use of this plant root. The treatment of diabetic patient with *Curcuma longa* fresh root juice will be more beneficial than allopathic treatments.

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