



## ANTIDIABETIC ACTIVITY OF *ACALYPHA INDICA* LINN. ON NORMAL AND ALLOXAN INDUCED DIABETIC RATS

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### ABSTRACT

The present investigation was carried out to study the antidiabetic effects of the methanol and acetone (70:30) extract of *Acalypha indica* Linn. in normal and Alloxan induced diabetic model. The antidiabetic effects of the methanol and acetone extract of *Acalypha indica* Linn. was evaluated in normal and Alloxan induced diabetic rats. Decreased blood glucose level of the test animals shows that the extract exhibit significant antidiabetic activity when compared to diabetic control group. The results also indicated the dose dependent effect. The antidiabetic activity produced by the extract may be due to increased uptake of glucose at the tissue level or by an increase in pancreatic beta cell function or due to inhibition of intestinal absorption of glucose. The present study supports the use of this herbal drug as antidiabetic.

**Keywords:** *Acalypha indica* Linn., Antidiabetic activity, Alloxan, Blood glucose

### INTRODUCTION

The incidence of diabetes is growing rapidly both in the United States and worldwide. For example, it is estimated that more than 180 million people worldwide are afflicted with diabetes, and the prevalence is expected to more than double by the year 2030. Diabetes is not a single disease. Rather, it is a heterogeneous group of syndromes characterized by an elevation of blood glucose caused by a relative or absolute deficiency of insulin. Diabetes mellitus is a metabolic disorder characterized by hyperglycaemia, glycosuria, hyperlipidemia, negative nitrogen balance and sometimes ketonemia.

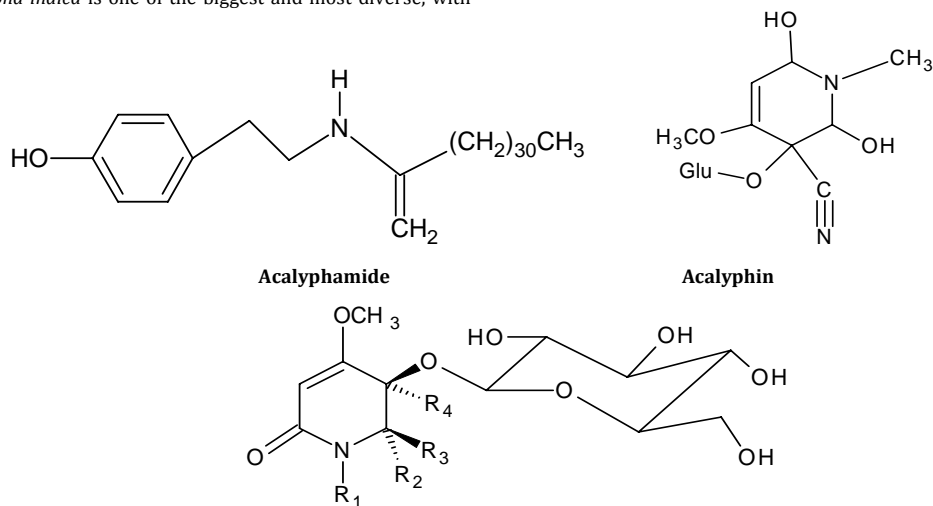
The American Diabetes Association (ADA) recognizes four clinical classifications of diabetes:

1. Type 1 diabetes (formerly insulin-dependent diabetes mellitus),
2. Type 2 diabetes (formerly non-insulin dependent diabetes mellitus),
3. Gestational diabetes, and
4. Diabetes due to other causes (e.g. genetic defects or medication induced).<sup>1</sup>

*Acalypha indica* Linn. consists of dried herb of *Acalypha indica* Linn. belonging to family Euphorbiaceae. Within the Euphorbiaceae family, *Acalypha indica* is one of the biggest and most diverse, with

nearly 450 species. Two thirds of its species are found in America, 19 of them in Venezuela, they are mainly used as ornamental, but with the rising of traditional medicine, these species are given medical properties painkillers, laxatives, anti-inflammatory and many others. *Acalypha indica* Linn. occurs in Nigeria and from Sudan east to Somalia and South through DR Congo and East Africa to Southern Africa including South Africa. It is also widespread in the Indian Ocean islands and occurs furthermore in India, South-East Asia and Oceania. It was introduced into the warmer parts of the New World. It is found throughout the plains of India as weed in gardens, in waste lands and along the roadsides. It is found in the hills of Orissa at altitudes upto 210 m. A part of the supply also comes from West Bengal, Andhra Pradesh, Tamil Nadu, and Kerala.

Phytochemically the plant has been reported to contain alkaloid 'acalypus' and 'acalyphine'. The leaves and twigs of *Acalypha indica* Linn. have been reported to contain acalyphamide, acalyphamide acetate, aurantiamide, aurantiamide acetate, succinamide, acalyphol acetate and 2-methyl antaquinone. Stigmasterol,  $\beta$ -sitosterol and its acetate have been isolated from the herb. Flavonoids, notably the kaempferol glycosides mauritianin, clitorin, nicotiflorin and biorobin, naringin, quercitrin, hesperitin have been isolated from the flowers and leaves. The other constituents are alkaloids, catechols, flavonoids, phenolic compounds, saponins and steroids. Volatile oil and fatty acids were also found.<sup>2,3,4,5,6,7</sup>



(-)-(5R,6S)-5-cyano-5- $\beta$ -D-glucopyranosyloxy-6-hydroxy-4-methoxy-1-methyl-2(5,6-dihydro)-pyridone

## MATERIAL AND METHODS

### Plant material

The whole plants of *Acalypha indica* Linn. were collected from Sri Chowdeshwari Nursery, Singanagra hara, Dommasandra to Chandapura road, Anekal taluk, Bengaluru (K.A.) in the month of September. Botanical identification was done by Dr. Zeaul Hasan, Department of Botany, Safia Science College, Bhopal whose voucher specimen No. was 141/Bot/Safia/2010.

### Extraction

The whole plant material were dried at room temperature until they were free from moisture. The plant material were coarsely powdered and stored in a clean dry air tight container and subjected to maceration by using solvent methanol and acetone in the fraction of 70:30 for 7 days. The obtained extract was then finally dried at low temperature in water bath to get an concentrated product of the extract.

### Animals

Albino Wistar Rats of either sex were used. The animals were housed in standard environmental conditions at  $25 \pm 2^\circ\text{C}$ , relative humidity  $50 \pm 15\%$  and normal photo period (12 hr dark and 12 hr light) for the experiment. The commercial diet and water were provided. The experimental protocol has been approved by the IAEC (Institutional Animal Ethical Clearance) of PBRI proposal number being PBRI/IAEC/2010/PN 63.

### Glucose tolerance test

Fasted rats were divided into four groups of six each. Group I served as normal control and received distilled water. Group II received 300 mg/kg body weight of the extract. Group III received 500 mg/kg body weight of the extract. Group IV received the standard drug Glibenclamide as an aqueous suspension at a dose of 5mg/kg. After 30 min of extract administration, the rats of all groups were orally treated with 2g/kg of glucose. Blood glucose were collected from the tail vein just prior to glucose administration and at 30 and 90 mins after glucose administration. Blood glucose levels were estimated using a glucose oxidase-peroxidase reactive strips and a Glucometer.

The animals were divided into four groups and each group consist of 6 rats

1. Normal control (vehicle only)
2. Diabetic rats treated with *Acalypha indica* Linn. extract 300 mg/kg.
3. Diabetic rats treated with *Acalypha indica* Linn. extract 500 mg/kg.
4. Diabetic rats treated with Glibenclamide 5mg/kg.<sup>8</sup>

### Induction of diabetes

Alloxan induced diabetic rats were used for the study of antidiabetic activity. Male wistar rats of weight 180-200g were divided into 4 groups of six animal each. These rats were induced diabetes by a single i.p injection of 120 mg/kg body weight of alloxan monohydrate in sterile normal saline. The rats were maintained on 5% glucose solution for next 24 hrs to prevent hypoglycaemia.

After 5 days blood sample were drawn from the tail vein and glucose level were determined to confirm the development of diabetes. Blood samples were collected from the tail vein just prior to and 1hr, 3hr and 5 hr after drug administration. The blood glucose, urea, total cholesterol, triglycerides levels of all the samples were determined.

The experimental animals were divided into four groups of 6 animals each

Group I : Diabetic rats received distilled water

Group II : Diabetic rats received *Acalypha indica* Linn. extract (300 mg/kg)

Group III : Diabetic rats received *Acalypha indica* Linn. extract (500 mg/kg)

Group IV : Diabetic rats received standard Glibenclamide (5 mg/kg).<sup>9</sup>

### Statistical analysis

The quantitative measurements in all the experiments were made on 6 animals in each group and the values were expressed as mean  $\pm$  SEM (Standard error mean). The data were subjected to one way ANOVA to determine the significance of changes followed by Bonferroni multiple comparisons to analyze the significance of difference within the experimental groups. P values with  $<0.05$  were considered as statistically significant.

## RESULTS

In the present study, the antidiabetic activity of extract of *Acalypha indica* Linn. was evaluated in normal and Alloxan induced diabetic rats. Fig [1] shows the effect of *Acalypha indica* Linn. extract on blood glucose level in normal rats representing the oral glucose tolerance test. Fig [2] shows the effect of *Acalypha indica* Linn. extract on blood glucose level in Alloxan induced diabetic rats. Diabetic rats treated with *Acalypha indica* Linn. extract at dose of 300 and 500 mg/kg showed significant decrease in blood glucose level at 3<sup>rd</sup> and 5<sup>th</sup> hour from initial levels. A significant time dependent antidiabetic effect was shown throughout the period of study.

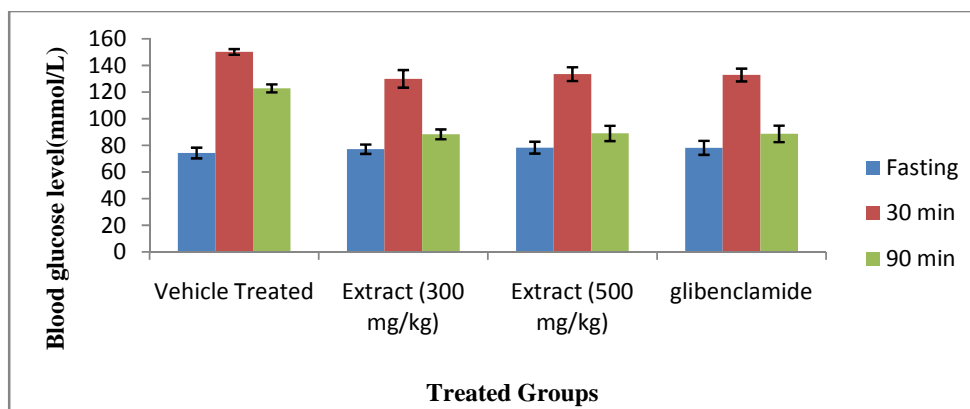


Fig. 1: Graph representing the effect of *Acalypha indica* Linn. extract on blood glucose in Oral glucose tolerance test

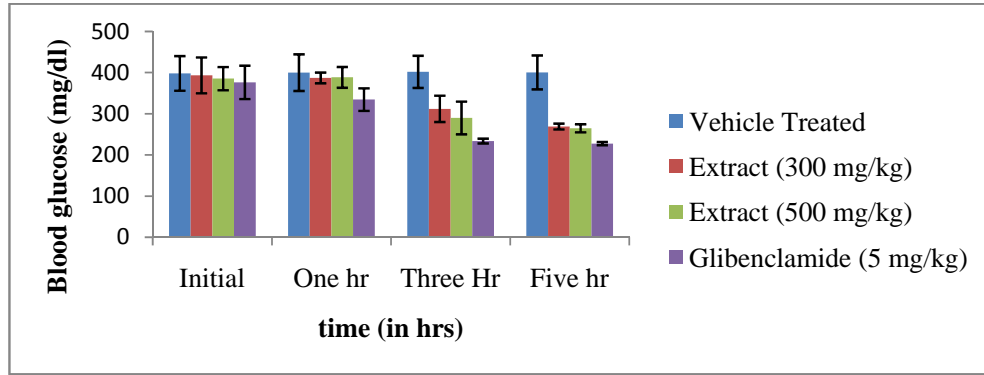


Fig. 2: Graph representing the effect of *Acalypha indica* Linn. Extract on Alloxan induced diabetic rats

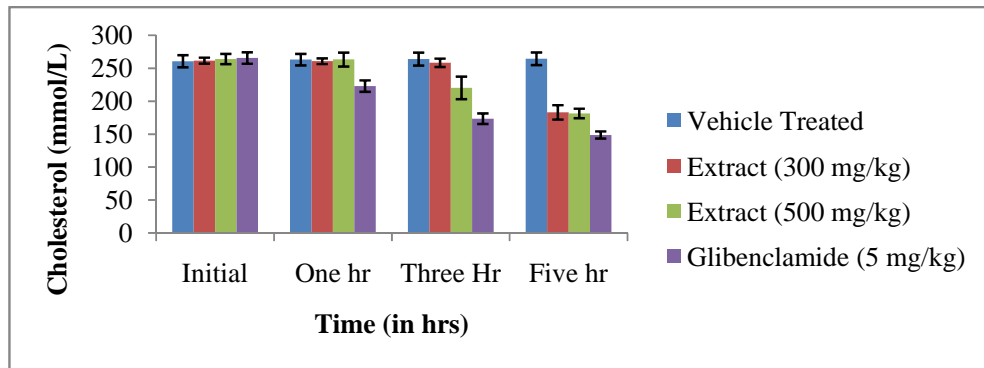


Fig. 3: Graph representing the effect of *Acalypha indica* Linn.extract on cholesterol level (mmol/L) of Alloxan induced diabetic rats

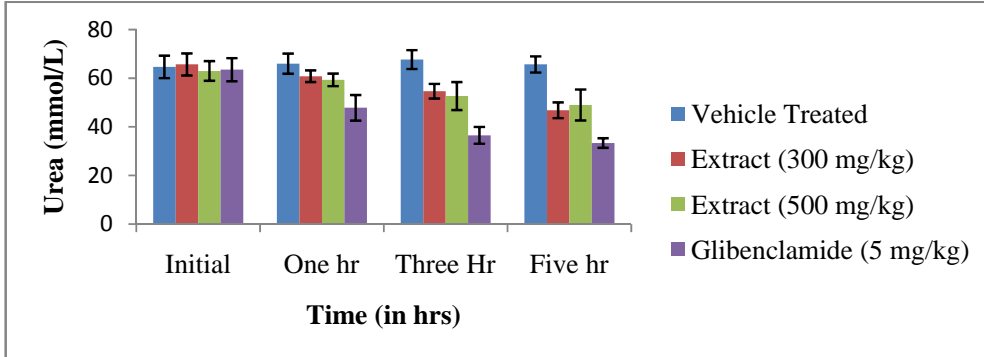


Fig. 4: Graph representing the effect of *Acalypha indica* Linn. extract on urea level (mmol/L) of Alloxan induced diabetic rats

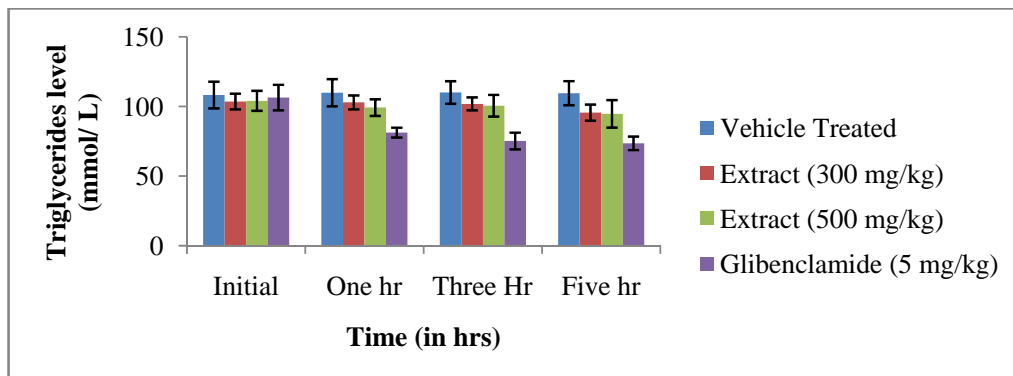


Fig. 5: Graph representing the effect of *Acalypha indica* Linn.extract on triglyceride level (mmol/L) of Alloxan induced diabetic rats

**DISCUSSION**

The effects of different extracts on glucose tolerance test in normal rats are shown in Fig [1]. At 30 min after glucose administration, the peak of blood glucose level increases rapidly from the fasting value and then subsequently decreased at 90 min.

Alloxan, a  $\beta$ -cytotoxin, destroys  $\beta$ -cells of islets of Langerhans of pancreas resulting in a decrease in endogenous insulin secretion and paves the ways for the decreased utilization of glucose by the tissue. It results in elevation of blood glucose level. Expression of elevated fasting blood glucose level confirmed induction of diabetes in alloxan-induced experimental rats. Maintenance of blood glucose level with extract treated rat indicates the effectiveness of the extract in experimental diabetic animal as shown in Fig [2]. The significant decrease of blood glucose was found in 3<sup>rd</sup> and 5<sup>th</sup> hr than that of the initial. The blood sample obtained from the alloxan-induced diabetic model at 0, 1, 3 & 5 hr were tested for the blood urea, cholesterol & triglycerides level. An abnormality in lipid profile is one of the common complications in diabetes mellitus. The administration of extract of *Acalypha indica* Linn. showed a slight decrease in total cholesterol, urea and triglycerides level as shown in Fig [3,4,5].

**CONCLUSION**

The plant *Acalypha indica* Linn. possess potential activity in decreasing the blood glucose level. Preliminary phytochemical screening indicate the presence of flavonoid in the extract. Flavonoid isolated from different sources are reported to have

antidiabetic activity, so the lead compound may be flavonoid. Further research is needed to isolate lead compound from this extract to find the exact active constituent responsible for the antidiabetic activity.

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