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ANTI-HYPERGLYCEMIC ACTIVITY OF *IPOMOEA BATATAS* LINN. (LAM) ROOTS EXTRACT

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ABSTRACT

Objective: To evaluate the anti-hyperglycemic activity of methanolic extract of *Ipomoea batatas* roots. **Materials and methods:** The methanolic extract of roots of *Ipomoea batatas* was tested for its hypoglycemic activity in normal glucose loaded and alloxan-induced hyperglycemic Wistar rats. Blood glucose levels were evaluated at intervals of 30and 90 minutes in normal glucose loaded animals, at intervals of 0, 1 and 3h in acute study and at days 1, 3, 7 and 10 during sub acute treatment after exact administration at an oral dose of 250 mg/kg. **Result and discussion**: During both acute and sub-acute test, the methanol extract showed statistically significant and considerable antihyperglycemic activity and enhanced glucose tolerance in normal glucose loaded rats. **Conclusion**: *Ipomoea batatas* roots possessed statistically significant antihyperglycemic potential in alloxan induced diabetic rats and enhanced glucose tolerance in glucose loaded normal rats.

Keywords: *Ipomoea batatas*, Antihyperglycemic activity and hypoglycemic.

INTRODUCTION

Diabetes mellitus is a major disease affecting nearly 10% of the population. Inspite of the introduction of hypoglycemic agents, diabetes and the related complications continue to be a major medical problem. Many indigenous Indian medicinal plants have been found to be successfully used to manage diabetes and some of them have been tested and the active principles isolated [1]. However, search for new antidiabetic drug continues. *Ipomoea batatas* Linn. (Lam) of family Convolvulaceae is a slender prostrate vine with tuberous roots which may be red or whiter in color. It is cultivated throughout India [2]. It contains protein,

thiamine, riboflavin, vitamin, phytosterol, resins, tannins, polysaccharides and coloring matter [3]. Phenolic compounds are also present [4]. It also contains resin glycosides, Simonins I-V, ether soluble resins [5]. It possesses wide range of activities such as tonic. It shows vasorelaxing property [6]. It also shows Antimutagenic activity [7]. It is used as diuretic and used in vitiated conditions of pitta burning sensation, hyperpiesia, and constipation. It shows Trypsin inhibitor activity [8]. The roots are considered as laxative [9]. Tubers containing starch suitable for sizing paper, textile and laundry use [10]. It shows α-glucosidase inhibitory action [11].

MATERIALS AND METHODS

Plant material

The fresh roots of *Ipomoea batatas* were collected from market of Belgaum and were positively identified by Dr. (Mrs.) M.Vasundara, Associate Professor (Hort.) & Principal Investigator (M&AP), UAS, GKVK, Banglore-65.

Preparation of extracts

The roots were shade dried at room temperature and powdered until able to pass through sieve no. 40. The dried roots were subjected to soxhlet using methanol. Concentrated under reduced pressure at 50^{o}C using rotavapour apparatus to get viscous mass which was then lyophilized and stored at 4^{0}C until used. The crude extract were subjected to preliminary phytochemical investigation [12] which showed presence of steroids, flavonoids, proteins, tannins, glycosides, triterpenoids and polysaccharides.

Animals

Male Wistar Albino rats (180-200g) were used in the experiment. Albino rats breed in the animal house, Sri Venkateshwara Enterprises, Bangalore (CPCSEA), and Reg. No. 276. They were maintained under standard environmental conditions and had free access to feed (Hindustan Lever, India) and tap water ad libitum during the quarantine period. The animals were fasted for 16hrs before experiment but allowed free access to water.

Studies in Normal glucose loaded animals

Effect of *Ipomoea batatas* methanolic extract on glucose tolerance in normal rats

Fasted normal rats were divided into two groups of five animals each. Group I served as control and received distilled water. GroupII received methanol extract at an oral dose of

250mg /kg. After 30min of extract administration, the rats of both the groups were orally treated with the 2g/kg of glucose. Blood samples were collected from the tip of the tail just prior to glucose administration and at 30and 90min after glucose levels were measured immediately by glucose oxidase method [13].

Induction of experimental hyperglycemia

Hyperglycemia was induced by a single I.P. injection of 120mg/kg of alloxan monohydrate (S.D.fine Chem., Mumbai, India) in sterile saline [14]. After 5 days of alloxan injection, the hyperglycemic rat (glucose level >300) mg/dl) were separated and used for the study.

Effect of *Ipomoea batatas* Methanolic extract on alloxan induced hyperglycemic rats.

Acute treatment

The hyperglycemic rats were divided into three groups of five diabetic animals each. Group I was previously selected from normal rats and served as normal control and was given distilled water and no alloxan group II served as diabetic control and were given distilled water. GroupIII received standard anti-diabetic drug gliclazide at an oral dose of 25mg/kg (Panacea Biotech Ltd., batch no.01030513). Group IV was treated orally with Methanolic extract at a dose of 250mg/kg; the dose was selected after preliminary behavioral and acute toxicity tests. The extract of the drug was found to be safe for further biological studies as no lethality was observed at 1000mg/kg, I.P. in mice. Blood samples were collected from the tip of tail just prior to and at 1and 3h after the extract /drug administration.

Sub-acute treatment

In sub acute treatment, the administration of extract /drug was continued for 10days, once daily. Blood samples were collected from the tip of the tail just prior to and on days 1, 3, 7 and 10 of the extract /drug administration. The blood samples by glucose oxidase method. Data were expressed as Me +- SE, n=5. Statistical significance was determined by using one way analysis of variance (ANNOVA) followed by Dunnet's t test.

Statistical Analysis [15]

The data presented as Mean ± SEM. The activities of both the leaves extracts were compared with the control. All the extracts showed significantly higher duration of paralysis and death. Values of $P< 0.05$ were considered statistically significant.

RESULTS AND DISCUSSION

The effect of Methanolic extract of *Ipomoea batatas* on glucose tolerance is shown in Table 1. By 30 min after starting the glucose tolerance test, the blood concentration increased rapidly from its initial value as was evident from control but the extract fed group showed marginal rise in glucose concentration at 30th min and remained up to 90th min.

The Methanolic extract of *Ipomoea batatas* has shown statistically significant (p>0.001) and considerable fall in blood glucose levels during acute treatment in alloxan induced hyperglycemic rats (Table 2). In the untreated animals, blood glucose level did not change significantly. During sub acute treatment with *Ipomoea batatas* extract in alloxan induced hyperglycemic rats a consistent reduction in the blood glucose level as compared to diabetic control was observed (Table 3).

Table No-1 Effect of *Ipomoea batatas* Methanolic extract (250 mg/kg, p.o.), on oral glucose tolerance in normal rats.

Group	Treatment p.o.	Blood glucose level (mg/dl)		
I	Glucose (2 g/kg)	70.00±1.00	94.66±3.93	73.27±1.71
II	Methanolic extract	70.60±1.030	74.00±2.88**	87.00±1.73*

Values are Mean ± S.E. n=5, p<0.001, p<0.05, NS: not significant vs. group I

Table No-2. Effect of acute treatment of *Ipomoea batatas* methanolic extract (250 mg/kg, p.o.), on blood glucose level in alloxan induced hyperglycemic rats.

Group	Treatment	Blood Glucose (mg/dl)		
		Basal value	1h	3h
I	Control (Distilled water only)	78.87±0.69	81.0±0.57	78.37±0.57
II	Diabetic Control (Alloxan only)	358±1.732	357.6±0.7.24	355.0±0.57
III	Standard (Alloxan + Std. Drug)	332.5±1.803	323.3±1.856^{NS}	314.3±1.856^{NS}
IV	Test (Alloxan + Extract)	379.0±4.933	288.20±3.43**	270.3±2.186**

Values are Mean ± S.E. n=5; ** p<0.001, NS: not significant vs. group II

Table No-3 Effect of sub acute treatment of *Ipomoea batatas* methanolic extract (250 mg/kg, p.o., once daily), on blood glucose level in alloxan induced hyperglycemic rats.

Group	Treatment	Blood Glucose (mg/dl)				
		Basal value	Day 1	Day 3	Day 7	Day 10
I	Control (Distilled water only)	77.87±0.69	97.53±1.794	95.77±0.23	92.87±0.466	91.33±0.44
II	Diabetic Control (Alloxan only)	358±1.732	355.8±0.928	352.7±0.88	353.3±1.202	351.9±0.378
III	Standard (Alloxan + Std. Drug)	328.5±1.803	307.3±0.89^{NS}	303.3±0.88 ^{NS}	301.0±1.0 ^{NS}	300.2±0.72 ^{NS}
IV	Test (Alloxan + Extract)	374.0±4.933	260.7±0.504**	234±3.512**	198.7±0.33**	165.5±0.76**

Values are Mean ± S.E.; n=5, ** p<0.001, NS: not significant vs. group II

The results indicate that *Ipomoea batatas* roots extract possessed significant anti-hyperglycemic activity in both acute and sub acute treatments. It is generally accepted that alloxan treatment causes destruction of β-cells [16]. It is, therefore, conceivable that the hypoglycemic principles in the methanolic extract of *Ipomoea batatas* roots may exert their effect by an extra pancreatic mechanism in diabetic rats. Since the blood glucose lowering effect of the extract of roots of *Ipomoea batatas* was observed in alloxan induced hyperglycemic rats as well as in fasted normal glucose loaded rats, this effect could possibly be due to increased peripheral glucose utilization.

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