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Biochemical Effect of Alloxan Diabetic Rats

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ABSTRACT

In the present study, an attempt has been made to investigate the antidiabetic effect of aqueous extract of seeds on alloxan induced diabetic rats. After the citrullus colocynthis plant treatment all the change were reversed and reaches the near normal level.

Introduction

Diabetes Mellitus affects approximately 150 million people around the world. It is forecasted that by 2025 this number would be doubled, with a prevalence that varies markedly from population to population (Rahilly *et. al*. 2005). Insulin promotes the storage of fats as well as glucose within specialized target cells and influences cell growth and the metabolic functions of a wide variety of tissues. Insulin plays vital role on several transport molecules that facilitate glucose transport across the cell membranes. These transporters elicit important role in the aetiology as well as the manifestations of diabetes. There are two types of glucose transporters. Na^+ dependent glucose transporters and facilitative glucose transporters.

Materials and methods

Plant materials

The fresh seeds of Citrullus colocynthis were collected from Perambalur, South India. The plant was identified, authenticated and the voucher specimen has been kept in our laboratory for future reference. The seeds were shade dried, powdered and passed through a 40-mesh sieve, and kept in a well closed container for further extraction.

Experimental Animals

The rats were 11-12 weeks of age at the time this study. They were acclimatized to the animal house conditions at least for one week before carrying out any experimental work. The experiments were designed and conducted in accordance with the ethical normal approved by Ministry of Social Justices and Empowerment, Government of India and Institutional Animal Ethics Committee Guidelines for the investigation of experimental pain in conscious animals.

Experimental Design

In the experiment total 30 rats were used. The rats were segregated into 5 groups after induction of alloxan diabetics.

Results and discussion

Diabetes mellitus is the world largest growing metabolic disease, and as the knowledge on the heterogeneity of this disorder is advanced, the need for more appropriate therapy increases (Baily and Day, 1986). Traditional plant medicines are used throughout the world for a range of diabetic complication. The study of such medicines might offer a natural key to unlock a diabetogenists pharmacy for the future.

The antihyperglycemic action may be by potentiation of pancreatic secretion of insulin which was clearly evidenced by the increased level of insulin in diabetic rats treated with the plant extract. A number of other plants have also been reported to have antihyperglycemic and insulin release stimulatory effect (Kaleem, et al., 2006).

The effect of citrullus colocynthis on urea, uric acid, creatinine and protein levels in control and experimental rats in serum were depicted (Table 2). Urea, uric acid, creatinine levels were significantly increased in diabetic control rats. After the treatment the levels were reversed. The protein levels were reduced in diabetic rats and the levels was raised after the plant and drug treatment.

Morris and Leon (1960) reported that increased urea and uric acid production in diabetes might be due to enhanced catabolism of liver plasma proteins and nucleic acids. The diabetic hyperglycemia induced by alloxan produces elevation of plasma levels of urea, uric acid and creatinine, which was considered significant markers of renal dysfunction (Alarcon et al., 2005).However in the present study, the citrullus colocynthis treated diabetic rats showed the near normal values of urea, uric acid and creatinine, which reflects the non toxic nature of the plant.

The levels of acid phosphatase, alkaline phosphatase, SGOT, SGPT in serum of control and experimental rats were depicted (Table 3). All the levels were significantly elevated in diabetic control rats. These changes were reversed by the administration of citrullus colocynthis aqueous extract and glibenclamide treated rats. Increased activities of phosphatases in diabetes may affect the transport of metabolites across the membrane due to alteration in dephosphorylation reaction. Enhanced levels of phosphatases causes increased intracellular inorganic phosphate which further affects the efficiency of ionic pumps which is reflected in decreased activities of Na^+-K^+ ATPases in diabetes (Sailaja et al., 2000). In uncontrolled diabetes, the acid phosphatase level was significantly increased.

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Table. 1

Effect of Citrullus colocynthis aqueous extract on blood glucose, Hemoglobin, Glycosylated Hemoglobin, Plasma Insulin and Urine sugar on control and experimental groups of rats.

Group	Blood Glucose (mg %)	Hemoglobin(g/dl)	Glycosylated Hemoglobin(mg/g)	Plasma Insulin (mg %)	Urine sugar
I	89.33± 2.16	11.3 ± 0.90	4.15 ± 0.15	92.16 ±6.49	Nil
II	90.5 ± 5.57 [a]	10.9± 0.48[a]	4.23 ± 0.20 [a]	90.01 ± 19.43 [a]	Nil
III	228 ± 5.6 [b*]	6.73 ± 0.57 [b*]	10.23 ± 0.38 [b*]	58.18 ±12.64 [b*]	+++
IV	109.17 ±16.25 [cd*]	9.8 ± 0.29 [cd*]	5.90 ± 0.88 [cd*]	93.56 ±2.39 [cd*]	+
V	89.6 ± 2.16 [c*]	11.6 ± 1.65 [c*]	4.95 ± 0.15 [c*]	95.66± 6.25 [c*]	+

Table: 2

Effect of Citrullus colocynthis aqueous extract on blood urea, uric acid, creatinine and protein levels on control and experimental groups of rats.

Group	Urea (mg %)	Uric acid (mg %)	Creatinine(mg)	Protein (g %)
I	38.65 ± 0.75	3.98 ± 0.12	O.46 ± 0.04	6.58 ± 0.34
II	37.16 ± 2.31 [a]	4.10 ± 0.23 [a]	0.45 ± 0.04 [a]	6.70 ± 0.40 [a]
III	51.93 ± 1.33 [b*]	6.88 ± 0.37 [b*]	1.81± 0.28 [b*]	4.19 ± 0.56 [b*]
IV	38.66 ± 2.51 [cd*]	4.33 ± 0.29 [cd*]	0.57 ± 0.26 [cd*]	6.26 ± 0.26 [cd*]
V	36.50 ± 5.557 [c*]	4.08 ± 0.14 [c*]	0.51 ± 0.02 [c*]	7.20 ± 0.18 [c*]

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