

ANTIDIABETIC ACTIVITY OF THE SEEDS OF ABRUS PRECATORIUS IN STREPTOZOTOCIN & NICOTINAMIDE INDUCED DIABETIC RATS

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Summary

The ethanolic extract of *Abrus Precatorius* was evaluated for Antidiabetic activity in Streptozotocin & Nicotinamide induced diabetic rats. In diabetic induced rats fed with *Abrus Precatorius* (100 & 200mg/kg b.wt) the fasting blood glucose levels were reduced to normal levels. Excess proliferation of epithelium in small intestine was observed in diabetic rats, which was reduced after feeding with ethanolic extract of *Abrus Precatorius*. There is no change in the pathology of kidney and stomach fed with *Abrus Precatorius*.

Key Words: Antidiabetic activity, *Abrus Precatorius*, Streptozotocin & Nicotinamide

Introduction

Diabetes is a disorder characterized by hyperglycemia or elevated blood glucose. Diabetes is most common endocrine disorder. Among diabetics, approximately 95% of patients are type II diabetes mellitus, whereas 5 % of patients have type I diabetes. Several drugs such as sulphonyl ureas and biguanides are presently available to treat diabetes mellitus. These drugs have side effects and there is search for new drugs to overcome these problems, management of diabetes with out side effects is a major problem. Hyperglycemia leads to alteration in metabolism of lipids, carbohydrates and proteins and an increased risk of complications like atherosclerosis, dislipidemia and other cardiac disorders increases morbidity and mortality [1].

Many medicinal plants are reported to be useful in diabetes [2-3]. *Abrus Precatorius* L. family Leguminosae [4] is a slender, perennial climber, leaves are glabrous with long internodes. It has a slender branch and a cylindrical wrinkled stem with a smooth-textured brown bark. The fruit which is a pod is flat, oblong and truncate shaped with a sharp deflexed beak and silky textured. The seeds were used to treat diabetes and chronic nephritis, the plant is also used in some traditional medicine to treat scratches and sores, the leaves are used for their antsuppurative properties. The plant is also traditionally used to treat tetanus, antifungal, antitumor, prevention of HIV and to prevent rabies [5-8].

The various parts of plant like leaf, seed, and root are used traditionally as abortifacient, aphrodisiac, convulsions & gastritis. Medicinal plants like *Aloe vera*, *Helicteres Isora* root, *Trigonella foenum graecum*, *Allium sativum*; *Gymnema slyvestre* and *Syzigium cumini* [9] have studied for treatment of diabetes. The present study was undertaken to evaluate Antidiabetic activity of the seeds of *Abrus Precatorius*.

Materials and Methods

Drugs and chemicals: The fresh seeds of *Abrus Precatorius*, were collected identified and authenticated by Dr.K.MadhavaChetty Department of Botany, Venkateswara University, Tirupathi.

Animals: Wistar rats weighing 200-225 grams of either sex were selected for the present study, procured two weeks prior to the study and maintained in institutional animal house, so that animals could acclimatize to the new environment. The Institutional Animal Ethics Committee's permission was obtained before starting the experiments on animals.

All the chemicals used for the study were of analytical grade and Streptozotocin (STZ) was procured from Sigma labs (Bangalore).

Acute oral toxicity studies: The aim of this study is to determine lethal dose. In this study the testing drug was administered in a single dose by oral route. The dose was increased in a graded manner. LD₅₀ in the acute toxicity test was observed at the dose of 2000 mg/kg-bw. Therefore 1/10th of the preceding dose (100 mg/kg-bw) was selected as lower dose and double of this dose (200 mg/kg bw) selected as higher dose for the study.

Streptozotocin- Nicotinamide Induced Diabetes[10]: Grouping and treatment of experimental animals:

For STZ and Nicotinamide induced type-II diabetes animals were divided into 5 groups of 6 animals each.

Group1: Administered vehicle serves as Normal control.

Group2: Administered Nicotinamide (110 mg/kg i.p.) and Streptozotocin (65 mg/kg i.p.) Serves as diabetic control

Group3: Diabetic rats treated with *Abrus Precatorius* (100 mg/kg, p.o. once daily)

Group4: Diabetic rats treated with *Abrus Precatorius* (200 mg/kg, p.o. once daily)

Group5: Administered Reference standard, Glibenclamide (10 mg/kg, p.o)

Hypoglycemic activity: Animals of all groups were fasted for 18hrs prior to the study and then treated with respective drugs. The blood was withdrawn by puncturing retro orbital plexus at 0, 1, 4, 8 hours and serum glucose was estimated.

Type-II Diabetes:

STZ and Nicotinamide induced Type-II diabetes.

Groups II, III, IV and V were induced diabetes with Nicotinamide (110mg/kg, i.p) followed by STZ (65mg/kg, i.p) after 15 minutes of Nicotinamide administration. Animals of all groups were treated with respective drugs with 31 days. On the 31st day blood was withdrawn by puncturing retro orbital plexus and serum glucose, cholesterol, triglycerides (TGS), HDL and serum insulin were estimated.

Statistical Analysis: The values were expressed as mean \pm SEM for 6 animals. The results were subjected to statistical analysis by using one- way ANOVA followed by Tukey- Kramer test to calculate the significance difference among the groups. $P < 0.05$ was considered as significant.

Results and Discussion

As shown in table 1, in STZ and Nicotinamide induced type-II diabetic model, the biochemical parameters such as glucose, cholesterol, Triglycerides were significantly increased and HDL levels were significantly decreased in diabetic control animals as compared to control animals. In *Abrus Precatorius* (both in lower and higher doses) and standard (Glibenclamide 10 mg/kg) treated group animals all the above said parameters were reversed significantly.

Table-1

Effect of ethanolic extract of *Abrus Precatorius* (100 and 200 mg/kg, p.o, once daily) on serum glucose, triglycerides, total cholesterol and HDL in type-2 diabetic rats:

Groups	Treatment	Serum glucose (mg/dl)	Serum TGS (mg/dl)	Total Cholesterol (mg/dl)	Serum HDL (mg/dl)
G1	Control	93.5 ± 3.384	71.33 ± 2.044	61 ± 2.082	41.6 ± 1.432
G2	Diabetic control	184.5 ± 3.354	233.66 ± 3.575	116.66 $\pm 2.871^{\dagger\dagger\dagger}$	29.16 $\pm 2.915^{\dagger\dagger\dagger}$
G3	Ethanolic extract AP(100 mg/kg)	169.5 ± 1.979	217.33 ± 3.106	114 ± 2.745	36.16 $\pm 1.078^*$
G4	Ethanolic extract AP(200 mg/kg)	131.16 ± 1.939	128.16 ± 1.167	103.66 $\pm 1.978^{**}$	38.16 $\pm 0.703^{**}$
G5	Standard Glibenclamide (10mg/kg)	96.5 ± 1.607	89 ± 2.422	87.83 $\pm 2.023^{***}$	40.33 $\pm 1.022^{***}$

Values expressed as mean \pm SEM for six animals; $^{\dagger\dagger\dagger}P < 0.001$ when compared to normal control group. $^{***}P < 0.001$, $^{**}P < 0.01$, $^*P < 0.1$ when compared to diabetic control group.

Momordica charantia, Gymnema sylvestre, Ocimum sanctum etc plants have also shown antihyperglycemic activity in various metabolic disorders like streptozotocin induced diabetes, FRD induced insulin resistance, HFD induced hyperlipidemic rats. The mechanisms of both allopathic medicines and the traditional herbal medicines to lower blood glucose are:

- to stimulate beta -cell of pancreatic islet to release insulin;
- to resist the hormones which rise blood glucose;
- to increase the sensitivity of insulin receptor site to insulin;
- to decrease the leading-out of glycogen;

- to enhance the use of glucose in the tissue and organ;
- to clear away free radicals, resist lipid peroxidation and
- correct the metabolic disorder of lipid and protein

Type II diabetes was induced by STZ and Nicotinamide. The proposed site of action for STZ is at nuclear DNA. During the decomposition of STZ, highly reactive carbanium ions are formed, which cause alkylation of DNA bases. STZ, may also damage the β -cell membrane and break the DNA strand which leads to the activation of poly (ADP-ribose) synthetase and NAD depletion, which leads to cell death and ultimately inducing hyperglycemia. These process evoke activation of the poly ADP ribose synthetase to repair the damaged DNA, and a large amount of Nicotinamide dinucleotide is consumed for restoration. Consumption of NAD is effectively supplemented by intake of Nicotinamide.

Oral administration of ethanolic extract of *Abrus Precatorius* (100 mg/kg, p.o and 200 mg/kg, p.o/31days) showed significant regression of the diabetic state and restored the deranged serum glucose, cholesterol, triglycerides and HDL parameters in STZ & Nicotinamide induced type II diabetes. Ethanolic extract of AP might be useful in treating type-II diabetes

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