Original Article

Catharanthus roseus Leaves as an Anti-diabetic and Hypolipidemic Agents in *Alloxan*- Induced Diabetic Rats

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ABSTRACT

Diabetes mellitus is one of well known significant disorders of the endocrine system. It is characterized by an abnormal increase in the glucose load. Feeding with aqueous extract of leaves of *Catharanthus roseus* commonly called as periwinkle in *alloxan*- induced diabetic rats significantly (P< 0.001) decreased blood glucose levels and has brought down TC,LDL,VLDL and TG close to normal level . In control rats, fed with the experimental leaves did not show any hypoglycaemia effect and no significant body weight changes were found indicating that *Catharanthus roseus* has anti- diabetic activity.

Keywords: *Catharanthus roseus*, *Diabetes mellitus*, *Alloxan*, Blood glucose level, Plasma lipid.

INTRODUCTION

All over the world, *Diabetes mellitus* is increasing. India presently has the largest number of people with *Diabetes mellitus*[1]. Though many new oral hypoglycaemia agents are now available, there is a great difficulty in choosing the right medication for longer period either due to side effects or due to the lack of response. Herbal drugs are wildly used in many parts of the world to cure various diseases. Nowadays the usage of natural products has increased and plant extracts are screened for new drug inventions[2-6]. Growing demand for herbal medicines is due to their effectiveness, minimal side effects and economical aspects.

The plant *Catharanthus roseus* is popularly known as periwinkle in India. It is often linked with the graveyard, has never found its place in garland due to bad odour. It grows up to a height of 50 cm. The glossy leaves are oblong in shape. The medicinal properties of this plant have been described in the *Ayurveda*. The importance of

Catharanthus roseus, was evaluated in the present study as anti- diabetic and hypolipidemic agent in *alloxan*- induced diabetic rats.

MATERIALS AND METHODS

Catharanthus roseus Linn (Apocynaceae), is a traditional medicinal plant used to control diabetes, in various regions of the world[4,5]. Experimental leaves were collected from our college garden and neighbouring cultivated area, it was washed well with the distilled water. 50 g of air-dried leaves were extracted in one litre of boiling water for 2 hours and were concentrated to half the volume. Brown extract obtained was cooled and filtered using Whatman filter paper. Leaf extract was introduced by intra- peritoneal administration of a single dose of 10 mg/ 100 g every day morning for a period of 30 days.

Adult albino rats (Wistar strain) aged about 3 months weighing between 400- 420 g and are free from any kind of infections were used. The animals were kept in the laboratory as per the guidelines. Experimental rats were kept fasting overnight and were allowed free access to water. The standard protocol for laboratory animal care was followed. Thirty two male albino rats (Wistar strain) were divided into four groups of eight rats each by random block design and were housed individually in wire mesh cages. A total of 32 rats were used in the present experiment, they were divided into 16 diabetic surviving rats and 16 control rats. The rats were further divided into four groups of eight each: control (C); control rats treated with C. roseus (C + CR); diabetic (D), and diabetic animals treated with *C. roseus* (D + CR). Diabetes was introduced by intra-peritoneal administration of 150 mg/kg body weight of ice cold aqueous alloxan monohydrate[3] to two groups of rats served on diabetic control and diabetic experimental, respectively. After a fortnight, hyperglycaemia was observed in both the groups of rats. The other two groups were kept as non- diabetic control and non- diabetic experimental, respectively. The rats were given high fibre and high protein diet. 20 g diets were fed and distilled water was provided ad libitum. The leftover food residues were collected to calculate the actual food intake. The blood was collected from 12-hour fasted experimental rats through the orbital sinus, by means of a capillary tube at 15-day intervals. Triglycerides, total cholesterol, and HDL-cholesterol were measured by enzymatic colorimetric end point methods using the diagnostic reagent kit. LDL and VLDL-cholesterol were obtained by calculations using the formula provided in the cholesterol diagnostic kit booklet.

The rats were weighed every week up to 4 weeks of experimental period to record the body weight changes. The initial and final blood glucose levels were measured from the tail veins with the help of glucometer[6]. The results were compared with the control groups of non- diabetic and diabetic rats with the initial values of the same groups.

Urine sugar was checked by uristrix strips from Bayer. The rats were observed continuously for gross behavioural changes. The data was analysed statistically using variances' test.

RESULTS AND DISCUSSION

Experimental observation and preliminary data about the mechanism of action of *Catharanthus roseus* will offer scientific explanation towards the treatment of *Diabetes mellitus.*

The LD^{50} value of the *Catharanthus roseus* leaf extract was high, No death occurred during the 30 days of experimental period. No mortality was seen even with the 30 times high dose feed of the leaf extracts.

Chronic treatment of diabetic rats with *Catharanthus roseus* leaf extract reduced the high blood glucose level to near normal levels. Table1. The results obtained showed normoglycemia in C + CR-rats, indicates that *C. roseus* promotes insulin sensitivity. The leaf extracts of *Catharanthus roseus* appears to be inhibiting *glucose- 6- phosphate dehydrogenase* thus controlling the elevated blood glucose levels. *Catharanthus roseus* changed the insulin action in tissues. It can be used in the treatment of diabetes. It improves the glycaemia control by enhancing the insulin sensitivity in liver and muscle. Improved metabolic control with *Catharanthus roseus* did not cause weight gain. The leaf extracts (table 2) elevated levels of total cholesterol, LDL and VLDL-cholesterol, and triglycerides and decreased level of HDL-cholesterol in the Diabetic-group, which are risk factors for coronary heart disease[7]. Insulin increases uptake of fatty acids into the adipose tissue and increases triglyceride synthesis[8]. Moreover, insulin inhibits lipolysis. Lipolysis is not inhibited in the D-group due to the presence of insulin deficiency, leading to hyperlipidemia. It is interesting that treatment with *C. roseus* leaf extract for 30 days brings down the elevated levels of total cholesterol, LDL and VLDL-cholesterol, and triglycerides, and also increases plasma HDL-cholesterol to normal levels in D + CR-rats, indicating the beneficial effect of *C. roseus* in reducing the risk of cardiovascular diseases. Increased levels of HDL-cholesterol, after *C. roseus* administration may be due to an increase in the activity of lecithin cholesterol acyltransferase, which may contribute to the regulation of blood lipids[9].

The behaviour of diabetic rats appeared sluggish and abnormally active initially but returned to normal after a week of treatment. The consumption of food increased initially which became normal in the treated rats. Fluid intake increased six times in the diabetic untreated rats while the intake of water was twice in *Catharanthus roseus* treated rats. Enhanced total cholesterol, triglycerides, LDL and VLDL-cholesterol, of diabetic rats were normalized in diabetic-treated rats.

CONCLUSION

The present study concluded that the leaf extracts of experimental plant taken for the study i.e. *Catharanthus roseus* helps in regulating and maintaining the homeostatic metabolism in the body. Extracts were found to be effective as an anti- diabetic agent. A detailed study on the metabolites of plant extracts of *Catharanthus roseus* on release of insulin, release of glucose and uptake of glucose is very essential to throw light on its anti diabetic activities.

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Table 1. Effect on PPG & FBG levels in blood glucose of diabetic rats after 30 days treatment with *Catharanthus roseus*

S. No.	Group	FBG (Initial) mg/ dl	FBG (Final) mg/ dl	PPG (Initial) mg/dl	PPG (Final) mg/dl
1	Control	69 ± 8.6	70 ± 5.4	100 ± 9.8	102 ± 7.6
2	Control +CR	68 ± 7.8	69 ± 5.8	102 ± 6.7	102 ± 9.8
3	Experimental (D+CR)	288± 8.4	141±6.3	258 ± 3.6	155 ± 5.2
4	Experimental (D)	279 ± 9.4	438 ± 4.6	287 ± 5.7	523 ± 7.8

Table 2. Effect on urine sugar and plasma lipid profile of diabetic rats after 30 day treatment with *Catharanthus roseus*

S. No.	Parameters	Control	Control + CR	Experimental (D)	Experimental D+CR
1	Urine Sugar	-ve	-ve	+5	-ve
2	HDL mg/dl	21 ± 0.2	37±0.41	42± 0.4	55± 0.4
3	LDL mg/dl	11.8± 0.13	10±0.34	43.4± 5.4	27.2±0.55
4	VLDL mg/dl	16.2±0.64	13±0.26	27.4± 0.87	21.8± 0.92
5	TC mg/dl	69±0.54	62±0.98	176 ± 1. 5	103± 0.5
6	TG mg/dl	81 ±0.9	68±0.67	150± 1.50	93± 0.5