

HYPOGLYCEMIC EFFECT OF ALOE VERA EXTRACT IN ALLOXAN-INDUCED DIABETIC ALBINO RATS

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SUMMARY: The present study was aimed to evaluate the antidiabetic activity of leaf extract of Aloe vera on forty adult male albino rats weighing 200-300 mg body weight (BW) which were divided into four groups (A, B, C and D), Group A served as control, Group B included normal rats treated with Aloe vera leaf extract (0.5 ml/100 gm BW), Group C and D were made diabetic by alloxan injection (65 mg/100 gm BW). Group C served as diabetic control while Group D was given Aloe vera leaf (AVL) extract at the same dose to Group B for 30 days. After 30 days the blood serum was analyzed for serum glucose level in all the four Groups. Twenty rats were randomly taken from these 40 rats for a follow up study and were not given AV extract. The serum glucose level was significantly ($P \leq 0.05$) decreased in AVL extract feeded rats in Group B and D indicating its hypoglycemic effect.

Key words: aloe vera, diabetic, albino rats, alloxan

INTRODUCTION

Diabetes mellitus is one of the most common metabolic diseases of human beings. Mortality and morbidity increase in diabetics mainly due to the associated chronic complications such as nephropathy and atherosclerosis. It is characterized by hyperglycemia together with biochemical alterations of glucose and lipid metabolism (9,10).

Aloe vera (AV), locally known as kawar gandal is a cactus-like plant with green, dagger-shaped leaves. The name was derived from the Arabic 'alloeh' meaning 'bitter', because of the bitter liquid found in the leaves. It is also known as 'lily of the desert' (2). AV has long been used all over the world for its various medicinal properties. During past 15 year, there have been controversial reports on the hypoglycemic effect of Aloe species, probably due to differences in the parts of the plant used or due to the model of diabetes chosen (11).

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Aloe vera leaf extract increases glucose tolerance in both normal and diabetic rats (1), and *A. vera* extract shows significant hypoglycemic effect on both clinical and experimental animals and human beings (7). *A. vera* leaf pulp and gel extracts were ineffective in lowering the blood sugar level of nondiabetic rats, but the leaf pulp extract showed hypoglycemic activity in diabetic rats (11).

The present study was conducted to evaluate the hypoglycemic effect of *Aloe vera* leaf extract on blood glucose levels in normal and alloxan-induced diabetic rats up to 30 days at different time intervals and than its residual effect after 15 days.

MATERIALS AND METHODS

Plant Material

Fresh leaves of *Aloe vera* (AV) were used in the present study. The aqueous extract of *Aloe vera* leaves was prepared by boiling 500 gms of leaves in 1 Litre distilled water for 10 min. After cooling to room temperature, the extract was filtered and stored in refrigerator (8).

Animal Groups

Forty albino rats (weighing 200-300 gm) were included in the study and were kept in cages in rat house under standard condition. The albino rats were divided into four groups (A= Control, B= Non-diabetic + *Aloe vera* extract, C= Diabetic and D= Diabetic + *Aloe vera* extract).

Induction of Diabetes

Diabetes mellitus was induced in overnight fasted animals by a single intraperitoneal injection of alloxan at a dose of 65 mg/kg body weight dissolved in 0.5ml acetate buffer (pH 5.5) immediately before use (5). After 7 days of alloxan injection, the serum glucose level was measured (1) and the treated rats showed hyperglycemia (serum glucose level more than 150 mg/dl were considered as diabetic) (15).

Administration of Extract

Aloe vera extract was orally administered at 0.5 ml/100 gm BW for 30 days daily. After 30 days of treatment no further AV extract was given for another 15 days and serum glucose level was studied to check the residual effect of AV extract.

Determination of Blood Glucose Level

1ml blood was collected from coccygial vein of each rat

and serum was obtained by centrifuging each blood sample at 3000 rpm for 10 minutes (12). Blood glucose level was determined by oxidase method using enzymatic kit (Human, Germany), as described by Barham and Trinder (4).

$$\text{Glucose concentration} = (\text{Abs test} / \text{Abs Standard}) \times 100$$

Statistical Analysis

Statistical analysis was done by ANOVA test using SPSS (version 18) software. The difference in values was indicated in the form of probability ($P \leq 0.05$) values.

RESULTS AND DISCUSSION

The present work was designed to investigate the hypoglycemic effects of *Aloe vera* extract in normal and alloxan-induced diabetic albino rats. Blood analysis was done to observe changes in blood glucose level of the rats at different time periods i.e., 1, 30 and 45 days after giving AVL extract.

Table 1 shows the serum glucose level on day 1, day 30 and day 45 of Group A (non-diabetic control group). There was non-significant difference in the serum glucose level ($P \geq 0.05$) because no treatment was given. The mean serum glucose level remains almost similar i.e., 110.75 ± 2.21 mg/dl, 110.5 ± 2.64 mg/dl and 111.25 ± 2.50 mg/dl on day 1, day 30 and day 45 respectively of the experiment. In Group B (non-diabetic + AV extract) the serum glucose level was significantly higher ($P \leq 0.05$) than control. Group C was diabetic and not given any herbal treatment. In this group serum glucose level showed non-significant difference ($P \geq 0.05$) on all 3 tested days. Group D (Diabetic+AV extract) showed significant decrease ($P \leq 0.05$) in serum blood glucose level as compared to day 1 on day 30 as shown in Table 1.

The outcome of present study showed that after 30 days of treatment with *Aloe vera*, diabetic and non-diabetic rats showed significant reduction effect ($P < 0.05$) on their blood glucose level. Glucose level of diabetic and non diabetic rats of Group B and Group D decreased significantly ($P < 0.05$) as compared to control groups. In all rats that were fed *Aloe vera* leaves extract the serum glucose level decreased significantly on 30th day indicating a positive effect of *Aloe vera* leaves extract in reducing diabetes. This effect may be due to stimulation of β cells of pancreas for increased

Table 1: Effect of Aloe vera on Serum Glucose Level.

Groups	1st day	30th day	45th day	P-values
	Mean \pm SD	Mean \pm SD	Mean \pm SD	
Non-diabetic	110.75 \pm 2.21	110.5 \pm 2.64	111.25 \pm 2.5	0.337*
Non-diabetic + Aloe Vera extract	113.2 \pm 3.19	95.8 \pm 4.49	88.8 \pm 5.80	0.004*
Diabetic	165.8 \pm 3.56	176.4 \pm 4.61	178.4 \pm 4.61	0.134*
Diabetic + Aloe Vera extract	173.6 \pm 4.92	141.2 \pm 9.14	136.4 \pm 8.53	0.000*

release of insulin or through any other mechanism involving glucose utilization. These results are in correlation with the findings of Helal *et al.* (8) who showed that the extract of *Aloe vera* exhibits effective hypoglycemic action in diabetic and normal rats. Similar results are also been reported by Rajasekaran *et al.* (14) and Can *et al.* (3) who showed the beneficial effects of *Aloe vera* extract.

After 30 days of treatment 5 animals of each group were decapitated and 5 other were kept for 15 days without any additional treatment as recovery period (to see that how much significant *Aloe vera* extract is in controlling blood sugar level). After 15 days of recovery period serum glucose levels of all groups were observed. During last 15 days (31st-45th day) although no *Aloe vera* was fed yet the serum glucose level remained significantly lower than the control and other groups which were not given *Aloe vera* extract during first 30 days. These finding are also in agreement with Helal *et al.* (8) and Olusola *et al.* (12). The control group which was without any treatment, consistently showed similar serum glucose level. Similar results are also reported by Edem (5).

Non-diabetic group B treated with *Aloe vera* extract showed a significant decrease in blood glucose levels

after 30 days of treatment ($P < 0.05$). There were significant changes ($P < 0.05$) in blood glucose level even after 15 days of recovery period. These findings are in agreement with Can *et al.* (3) who showed that there was significant decrease in blood glucose level.

In group C which was diabetic, significant changes ($P < 0.05$) in blood glucose level were observed. These findings were correlated with the work of Edem (5) and Olusola *et al.* (12) who showed decrease in blood glucose level of groups fed with *Aloe vera*. A significant decrease in blood glucose levels was also observed in group D rats which were given *Aloe vera* extract (500 μ l/100 gm body weight) ($P < 0.05$). These findings are correlated with the work of Helal *et al.* (8), Rajasekaran *et al.* (14) and Can *et al.* (3) who showed the hypoglycemic effect of *Aloe vera* extract.

CONCLUSION

It can be presumed that since rat is genotypically very similar to human beings. Therefore *Aloe vera* may be a beneficial hypoglycemic pharmaceutical agent for controlling blood glucose level of diabetic patients. However further studies are needed to confirm the exact mechanism by which *Aloe vera* extract decreases the blood sugar level.

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