

Research Article

## Effect of Aloe Vera Leaf Extract on Alloxan Induced Diabetes in Young Mice

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### ABSTRACT

Diabetes mellitus is a group of metabolic disorders, characterized by defects in insulin secretion, insulin action or both. The synthetic oral drugs are used for treatment of diabetes. These drugs are associated with number of side effects. Management of diabetes without any side effect is still challenge to medical system. Present work aimed to evaluate hypoglycemic and antioxidant potency of *Aloe vera* leaf extract in alloxan induced diabetes in young mice. For this work young mice (1-2 month) divided into three groups viz; control group, alloxan induced diabetic group and recovery group were used. The estimation of blood glucose level and antioxidative enzymes viz; Superoxide dismutase (SOD), Catalase (CAT) and Glutathione peroxidase (GPx) was carried out from pancreas. The treatment of *Aloe vera* leaf extract resulted in to a remarkable decrease in blood glucose level and an increase in SOD, CAT, and GPx in the pancreas of diabetic mice.

**Keywords:** Diabetes mellitus, antioxidant enzyme, *Aloe vera*, hypoglycemia

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### INTRODUCTION

Diabetes is currently one of the biggest health concerns that the world is faced with<sup>18</sup>. Diabetes mellitus is a group of metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. The chronic hyperglycemia of diabetes is associated with long term damage, dysfunction or failure of various organs, especially the eyes, kidney, nerve, heart and blood vessels<sup>1</sup>.

Hyperglycemia can increase oxidative stress due to increased mitochondrial production of the super oxide dismutase<sup>16</sup>. Enhanced oxidative stress is considered an underlying condition that is responsible for some of the complications of diabetes<sup>15</sup>. Antioxidant micronutrients have been indicated to boost the antioxidant defense and the deleterious effects of reactive oxygen species<sup>2</sup>.

*Aloe vera* has long history of use in herbal medicine in the tropical areas. *Aloe vera* are claimed to be used in natural medicine. In view of this the present study was designed to evaluate hypoglycemic and oxidative effect of *A. vera* leaf extract in alloxan induced D.mellitus in young mice as an experimental model.

### MATERIALS AND METHOD

#### *Plant material and Preparation of Extract*

The fresh leaves of *Aloe vera* were washed thoroughly with water, peel was removed, and the pulp was collected. The pulp was lyophilized. Extraction of lyophilized material was carried out by soxhlet method<sup>14</sup>. The extraction was carried out for 24 hrs. The obtained extract was dried at 37°C in oven. The yield was stored in refrigerator at 8°C until further use.

#### *Animals*

Two month old Swiss albino mice weighed 20-22 g were used. Animals were maintained under standardized animal housing conditions. They were supplied with Amrut mice feed (Pranav agro industries) and water ad libitum.

#### *Induction of diabetes*

Diabetes mellitus was induced by intraperitoneal injection of alloxan monohydrate (120 mg/kg) body weight<sup>7</sup>. Alloxan dissolved in 0.15 M acetate buffer, P<sup>H</sup> 5.5 was used for injection. Prior to administration of alloxan, mice were fasted overnight but given water ad libitum. After 72 hr mice with blood glucose level above 200 mg/dl were considered to be diabetic and were used for experimentation.

#### *Experimental protocol*

Mice were divided into 3 groups of five mice each.

Group I: Control group mice given with 0.15 M acetate buffer, P<sup>H</sup> 5.5

Group II: Mice were made diabetic by a single intraperitoneal injection of alloxan 120 mg/kg with acetate buffer (P<sup>H</sup> 5.5)

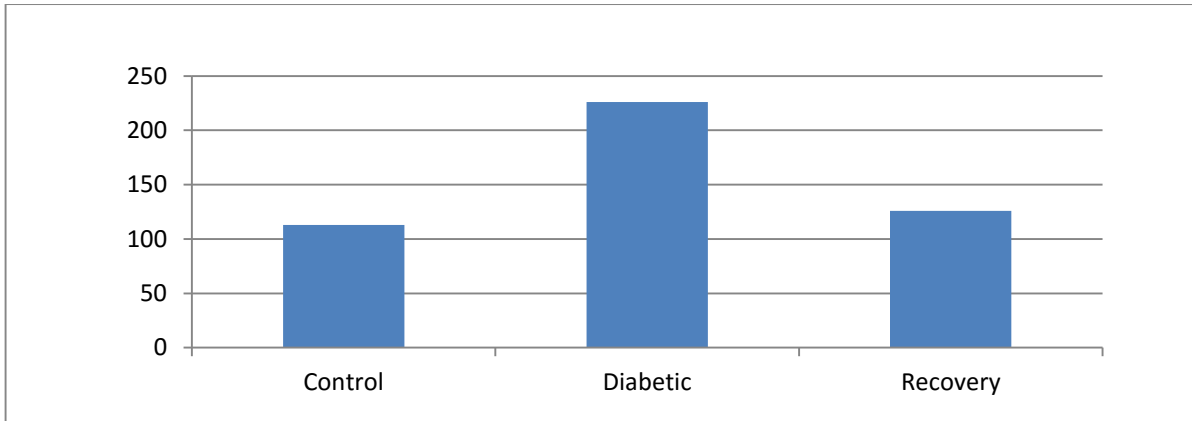
Group III: Diabetic mice treated with *A. vera* leaf extract 300 mg/kg body weight for 15 days.

#### *Parameters*

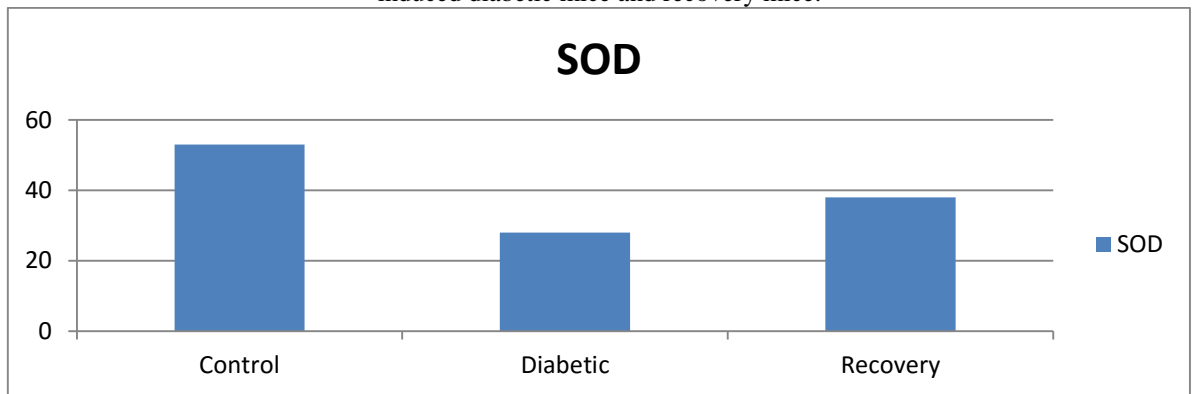
**Blood glucose:** Blood was obtained from mice tail after incision with sharp blade. Blood glucose level was measured using one touch test strips (Sugar scan 729, Thyrocare). The glucose level of the animal was displayed on the glucometer in about 5 seconds.

#### *Antioxidant enzymes*

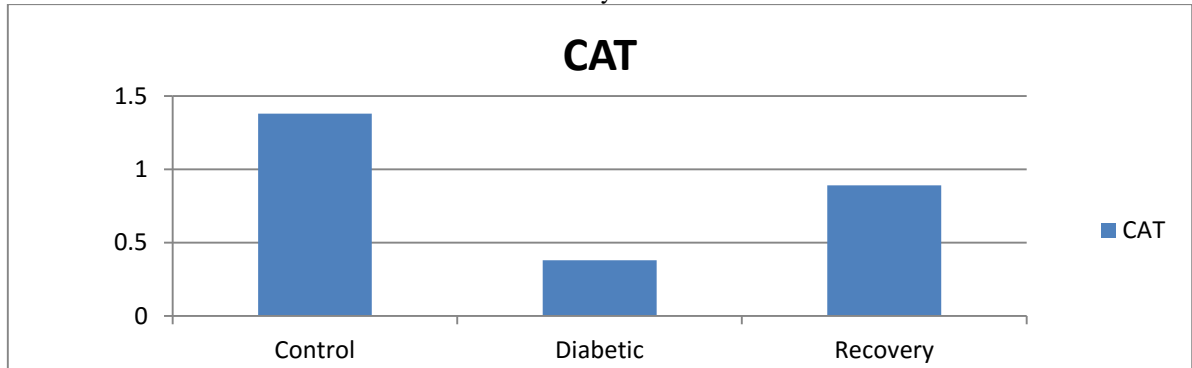
Total SOD activity was performed according to Beauchamp and Frodovich (1971) by calculating percentage of formazone dye formation<sup>3</sup>.



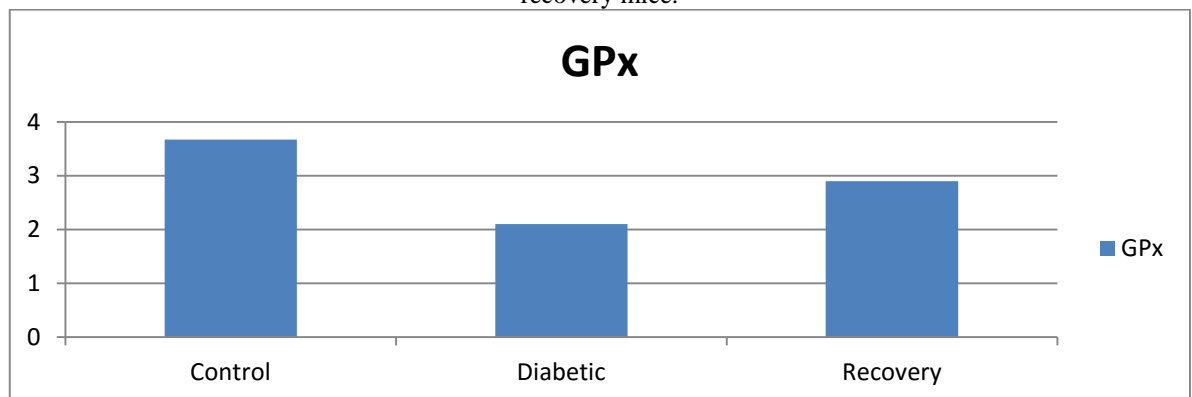
Graph No. 1 Graph showing comparative blood glucose level (mg/dl) in control, alloxan induced diabetic mice and recovery mice.



Graph No. 2 Graph showing comparative level of SOD (µg/protein) in control, alloxan induced diabetic mice and recovery mice.



Graph No. 3 Graph showing comparative level of CAT (µg/protein) in control, alloxan induced diabetic mice and recovery mice.



Graph No. 4 Graph showing comparative level of GPx (µg/protein) in control, alloxan induced diabetic mice and recovery mice.

The catalase mediated decomposition of H<sub>2</sub>O<sub>2</sub> was estimated directly at 240 nm with a modified method of Luck (1974)<sup>12</sup>.

Glutathione peroxidase activity was assayed spectrophotometrically by using Beers and Sizer (1952)<sup>4</sup>.

## RESULTS

Results obtained in the present investigation in relation with changes in blood glucose level in control, diabetic and on recovery of diabetic mice with *A. vera* extract, are presented in graph No 1. Oral administration of *A. vera* leaf extract (300 mg/kg) body weight in alloxan induced diabetic mice for 15 days showed significant decrease in blood glucose as compared with diabetic mice.

Graph No. 2 showed comparative antioxidant enzymes activity in pancreas, a statistically significant decrease in all three enzymes (Total SOD, CAT, GPx) activity was found in pancreas of alloxan induced diabetic mice as compared to control group. The activities of SOD, CAT, GPx were elevated and almost equal in pancreas of *A. vera* leaf extract received recovery group as compared to diabetic group.

## DISCUSSION

Present study was undertaken to demonstrate the effect of *A. vera* leaf extract on glucose level and antioxidant activity in alloxan induced diabetic mice. Alloxan causes diabetes through its ability to destroy the insulin producing B cells of pancreas<sup>11</sup>. Diabetes caused due to excess production of reactive oxygen species (ROS) leading to cytotoxicity in pancreatic B cells which reduces the synthesis and release of insulin<sup>9</sup>. Decreased antioxidant enzyme level and glucose level was well documented in alloxan induced diabetes<sup>17</sup>.

Administration of alloxan increased blood glucose level when compared to control and also induced persistent diabetes mellitus in mice. Present study also indicates the efficacy of *A. vera* leaf extract in decreasing the blood glucose level in diabetic mice.

Antioxidant enzymes are critical part of cellular protection against ROS and ultimately oxidative stress. Oxidative stress is determined by the balance between the generation of ROS such as superoxide anion (O<sup>-2</sup>) and the antioxidant defense system such as superoxide anion (O<sup>-2</sup>) and the antioxidant defense system such as superoxide dismutase (SOD). Antioxidant enzyme involved in the elimination of ROS includes SOD, CAT, GPx respectively. The present study showed decrease in the activity of all measured antioxidant enzyme in diabetic mice. These indicate a decrease in the antioxidant defense system. However, the treatment with *A. vera* in mice increased the activities of antioxidant enzymes. Since, oxidative stress contributes significantly to the pathophysiology of diabetes<sup>13</sup>.

Substances that suppress oxidative stress might be therapeutically beneficial. Studies have shown that exogenously administered antioxidant have protective effects of diabetes, thus providing insight into the relationship between free radicals and diabetes<sup>10</sup>.

## CONCLUSION

The present study revealed that the *A. vera* leaf extract act as hypoglycemic and antioxidant agent. The bioactive components might be responsible for the observed activities. Phytochemical screening of leaf extract of *A. vera* revealed the presence of flavonoids which might be the active ingredients responsible for these activities. Further isolation and identification of these active ingredients may be fruitful.

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