The study on medical applications of Aloe vera and Ficus benghalensis

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ABSTRACT

The Aloe vera is best antioxidant compound used in various disease and wounds (skin). In antidiabetic studies the extract was given orally for pancreatic healing and increase the beta cell for control the hyperglycemic condition. Ficus benghalensis is called as banyan tree in English it’s an ancient traditional plant in India from this studies in leaf 3’,5'-dimethyleether lucocyanidin-3-O-β-D-galactoseylcellobioside and crude protein, cellulose and various compounds are present in extract. It is help to produce the insulin in high amount in diabetic condition. The results of the present study indicated that Aloe vera and Ficus benghalensis leaf extracts was found to reduce the glucose level in animals made diabetic with alloxan. Alloxan has been shown to induce free radical production and cause tissue injury it can be presumed that since mice is genotypically very similar to human beings. Therefore Aloe vera and Ficus benghalensis 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 and Ficus benghalensis extracts decreases the blood sugar level.

Key words: Aloe vera, Ficus benghalensis, D-galactoseylcellobioside, Alloxan, Diabetic nephropathy.

INTRODUCTION

Alloxan (2,4,5,6-tetraoxypyrimidine; 2,4,5,6-pyrimidinetetrole) is an oxygenated pyrimidine derivative Alloxan is a toxic glucose analogue, which selectively destroys insulin-producing cells in the pancreas when administered to rodents and many other animal species. This causes an insulin-dependent diabetes mellitus (called "Alloxan Diabetes") in these animals, with characteristics similar to type 1 diabetes in humans (Lenzen, 2008).

Diabetes is a metabolic disorder characterized by hyperglycemia due to defective insulin excretion, defective insulin action, or both. Type-II diabetes mellitus (T2DM) ranges from predominant insulin resistance with relative insulin deficiency to a predominant secretory defect with insulin resistance. The chronic hyperglycemia of diabetes is associated with significant long-term squalene. Diabetic complications are the principle causes of morbidity and mortality in human populations. Diabetic nephropathy (DN) is one of the major diabetic complications and a single leading cause of end-stage renal disease. Persistent albuminuria is the earliest maker of DN and risk marker of increased cardiovascular disease (Lu and Randell, 2011).

The Plant contains flavonoids terpenoids lections fattyacids, cholesterol, anthraquinones, Chromones 8-C-glucosyl-7-O-methylaloediol, 8-C-glucosyl-noreugenin, Isoaloeresin D, iso rabai chromone, neaoloesin A) mono and polysaccharides (pectins, hemicelluloses, glucomannan, acemannan, and mannose...
derivatives) tannins, sterols (lupeol, campesterol, and β-sitosterol), salicylic acid, organic acids, enzymes, saponins, vitamins, minerals, aloin, anthrone, aloe emodin (3-hydroxyethyl-chrysazin), aloetic acid, choline and choline salicylate, complex mucopolysaccharides similar to hyaluronic acid, sapogenins and enzymes such as catalase, amylase, cellulase and alliinase. Minerals such as calcium, magnesium, potassium, sodium, aluminum, iron and zinc. Amino acids such as arginine, asparagine, glutamic acid, aspartic acid and serine. Vitamins such as B1, B2, B6, C, β-carotene, choline, folic acid, α-tocopherol are present. Free monosaccharides consisted of D mannose and D-glucose in a molar ratio of 5:4 and trace amounts of xylose, rhamnose, galactose, and either (Joseph and Justin, 2010).

Elevated blood sugar, indicative of diabetes, leads to increased oxidative stress which is associated with the pathogenesis of diabetes. Oxidative damage has been demonstrated in arterial samples from human diabetic subjects and patients with diabetes have decreased antioxidant defenses. Although type II diabetes can often be managed solely by exercise and a healthy diet, oral medications may be required to control blood sugar. But the management of diabetes without side effects, such as weight gain and increased risk of chronic disease drives further research for alternatives such as natural products with anti-diabetic activity and protection from the damaging effects of oxidative stress. (Ken J, 2007).

Preclinical and clinical research shows that Aloe vera has significant antidiabetic activity including normalization of blood glucose and protection from oxidative stress. Aloe vera has been shown in human clinical trials to be as effective as glibenclamide in controlling blood glucose and in one study Aloe supplementation was shown effective in patients unresponsive to glibenclamide. In animal studies Aloe supplementation showed significant reductions in blood triglycerides, free fatty acids and phospholipids, and significant reductions in LDL and VLDL while increasing HDL without weight gain normally associated with conventional medications. Patients with diabetes have decreased antioxidant defenses and lower levels of antioxidants such as vitamins C and E as well as reduced activities of Phase II antioxidant enzymes such as CAT, SOD and GPx. Oral supplementation with Aloe vera has been shown to naturally stimulate production of these Phase II enzymes and, in human clinical studies, increase the bioavailability and half-life of vitamins C and E in the blood. Additional studies show that Aloe supplementation can increase GSH, decrease NEG, LPO, ALP and ALT, suggesting that Aloe vera may also protect against diabetes-related hepatotoxicity. (Jones, 2007).

Polysaccharides make up most of the dry matter of the A. vera parenchyma. A storage polysaccharide, acetylated glucomannan, is located within the protoplasm of the parenchyma cells and a variety of polysaccharides are present in the cell wall matrix (Josias, 2008).

Diabetes mellitus is major manifestations which include disordered metabolism and inappropriate hyperglycemia. It is thought that many stresses in the modern lifestyle may cause an increased incident of diseases such as cancer, heart diseases and hypertension. The rising incidence of such diseases is alarming and becoming serious public health problem. Diabetes is one such disease and it is estimated that the number of diabetes patients will continue to increase in future. (Sachan et al., 2009).

The species of genus Ficus have the most potent hypoglycemic effects. The majority of the experiments confirmed the benefits of medicinal plants with hypoglycemic effects in the management of diabetes mellitus. Numerous mechanisms have been proposed for these plant extracts. All of these actions may be responsible for the reduction of diabetic complications (Brouham et al., 2006).

Plants are well known in traditional herbal medicine for their hypoglycemic activities, and there are more than 800 plant species showing hypoglycemic activity. There has been increasing demand for the use of plant products against diabetes due to low cost, easy availability and lesser side effects. Therefore, plant materials are continuously scrutinized and explored for their effect as hypoglycemic agents. (Sharma and Kumar, 2010).

Polysaccharides are found in abundance in Nature and are readily available from sources such as algae (e.g. alginates), plants (e.g. pectin, guar gum, mannan), microbes (e.g. dextran, xanthan gum) and animals (e.g. chitosan, chondroitin) and they can also be produced by means of recombinant DNA techniques. Monosaccharide polymers have many favorable properties such as high stability, nontoxicity, hydrophobicity, biodegradability, gel forming properties and ease of chemical modification. An enormous variety in plant polysaccharide structural composition exists, which is not only associated with different plants, but also with the part of the plant that they originate from, such as the leaves, seeds, roots and tubers. Complex carbohydrates obtained from natural sources such as plants have shown diverse biological activities such as wound healing, enhancement of the reticulo endothelial system, stimulation of the immune system, treatment of tumors and effects on the hematopoietic system. Aloe vera (L.) Burm.F. (Aloe barbadensis Miller) is a perennial succulent xerophyte, which develops water storage tissue in the leaves to survive in dry areas of low or erratic rainfall. The
innermost part of the leaf is a clear, soft, moist and slippery tissue that consists of large thin-walled parenchyma cells in which water is held in the form of viscous mucilage. Therefore, the thick fleshy leaves of Aloe plants contain not only cell wall carbohydrates such as cellulose and hemicellulose but also storage carbohydrates such as acetylated mannans (Josias et al., 2008).

Pancreas is the primary organ involved in sensing the organism’s dietary and energetic states via glucose concentration in the blood and in response to elevated blood glucose, insulin is secreted. Alloxan is one of the usual substances used for the induction of diabetes mellitus apart from streptozotocin. Alloxan has a destructive effect on the beta cells of the pancreas. Alloxan causes a massive reduction in insulin release by the destruction of β-cells of the islets of Langerhans, there by inducing hyperglycemia. Insulin deficiency leads to various metabolic alterations in the animals viz increased blood glucose, increased cholesterol, increased levels of alkaline phosphate and transaminases (Patel and Shivakumar, 2010).

Diabetes mellitus is the most common endocrine disorder that impairs glucose homeostasis resulting in severe diabetic complications including retinopathy, angiopathy, nephropathy, and neuropathy and causing neurological disorders due to perturbation in utilization of glucose. In the present study diabetes was induced in albino rat models with alloxan monohydrate. Ficus glomerata Linn, has been claimed to possess antidiabetic properties by many investigators. The present study was undertaken to screen the hypoglycemic activity of ethanol extracts of leaves of F. Glomerata. The results showed that it has significant anti hyperglycemic effect in experimental model of diabetes mellitus (Vivek KS and Suresh K, 2010).

The level of serum lipids are usually elevated in diabetes mellitus and such an elevation represents a risk factor for coronary heart disease. This abnormally high level of serum lipids is mainly due to the uninhibited actions of lipolytic hormones on the fat depots, mainly due to the action of insulin. Under normal circumstances, insulin activates the enzyme lipoprotein lipase, insulin deficiency, resulting in hyperglycemia and insulin deficiency is also associated with hypercholesterolemia due to metabolic abnormalities. The diabetic hyperglycemia induced by alloxan product elevated plasma levels of urea and creatinine, which are consider significant markers of renal dysfunction (Jarakal et al., 2008).

The damage of pancreas in alloxan-treated diabetic control rats and regeneration of cells by glibenclamide was observed. Beneficial role of carotene in reducing diabetic complication like glycosylation in alloxan-induced diabetic rats had been reported previously (Nagappa et al., 2003).

Alloxan causes diabetes through its ability to destroy the insulin-producing beta cells of the pancreas. In vitro studies have shown that alloxan is selectively toxic to pancreatic beta cells, leading to the induction of cells necrosis. The cytotoxic action of alloxan is mediated by reactive oxygen species, with a simultaneous massive increase in cytosolic calcium concentration, leading to a rapid distraction of beta cells (Bhagwat et al., 2008).

The polysaccharide extracted from Huidouba (PEH) exhibited a significant anti-diabetic activity. The polysaccharide contained glucose, mannose and galactose in a content ratio of 1.00:0.34:0.32. After administration with 50-200 mg/kg body weight of PEH to type II diabetic mice induced by alloxan for four weeks, the blood glucose level of mice was decreased significantly. Moreover, the SOD activity increased at the same time. PEH showed a significant anti-diabetic and anti-oxidation activity. In addition, PEH affected the BUN and ALT levels, which are important characteristics of diabetes mellitus (LIU Yan et al., 2009).

A glucose tolerance test is conducted to find out how quickly it is cleared from the blood. The mice were tested in a fasting state (having no food or drink except water for at least 10 hours but not greater than 16 hours). An initial blood sugar is drawn and then the mice are fed glucose. Then blood of mice is tested again 30 minutes, 1 hour, 2 hours and 3 hours after drinking the high glucose drink using glucose estimation kit. For determination of serum glucose level, blood Samples of normal and diabetic mice were drawn after an overnight fasting (12 hr.) from tail vein at different time intervals (both normal and Alloxan induced mice) (Abu Hasamat Md et al., 2010).

Oxidative stress which is defined as an imbalance between the generation of oxidants and antioxidant defense capacity of the body is suggested as a mechanism underlying diabetes and diabetic complication like many other diseases. Several mechanism seem to be involved in the genesis of oxidative stress in both diabetic patients and experimental animals like glucose auto oxidation, protein glycation, formation of advanced glycation products and the polyol pathway. Antioxidation defense agents such as glutathione or vitamin C. the increase in the levels of reactive oxygen species and free radicals cause damage in the biological structure such as cell wall, genetic material and enzymes. These oxidants also cause micro vascular and macro vascular complication, cardiovascular disease, kidney and nerve damage (Sendogdu, 2006).

The level of blood glucose, plasma insulin and serum C-peptide, and activities of the glucose metabolizing enzyme shexokinase and glucose-6-phosphatase were estimated and studied in streptozotocin.
diabetic rats. The findings were compared between normal, diabetic and spirulina supplemented diabetic rats. The finding indicated that the administration of spirulina tended to remedies for diabetic may provide valuable leads for the development of alternative drugs and strategies. Alternatives are clearly needed for many rural populations. Particularly developing countries. Diabetic neuropathy is one of the microvascular complications of disease. The factors include advanced glycation, increased formation of polyols and activation of protein kinase-C. Hemodynamic factors include systemic hypertension, intraglomerular hypertension and the role of vasoactive hormones, such as angiotensin-II. Clinical course progress from microalbuminuria overt proteinuria and then to renal failure (Rao and Nammi, 2006).

Plant Material and Identification
Fresh leaf of the Aloe vera was collected from Villupuram, Tamil nadu and Ficus benghalensis leaf was collected from Karunyanagar, Coimbatore, Tamil nadu, India.

Preparation and Administration of extract
Preparation of plant extract
Aloe vera gel preparation
Mature, healthy and fresh leaves of A. vera washed with fresh water. The thick epidermis was selectively removed. The inner colorless, mucilaginous pulp was homogenized and centrifuged at 6400 g at 4°C for 15 min to remove the fibers. The resultant supernatant was lyophilized immediately. The lyophilized sample was extracted with 95% ethanol. The filtrate was collected and evaporated to dryness under reduced pressure of 250 mmHg in a rotary evaporator. A known amount of solvent-free extract was suspended in sterilized water fresh each time and administered intragastrically.

Preparation of Hot Water Extract
The leaf of F. benghalensis was cleaned and dried in sun. Sixty grams of dried leaf was extracted with 500 ml of distilled water by boiling for thirty minutes over a mild flame and filtered through cotton. The filtrate was centrifuged at room temperature at 11,000 r.p.m., for twenty minutes. The clear supernatant free from finely suspended particles was used as the hot water extract.

Phytochemical Screening
Phytochemical screening of the prepared extracts was conducted with various qualitative tests to identify the presence of chemical constituents. To perform the tests the following chemicals and reagents were used: Carbohydrates with Molisch’s test.

Administration of Aloe vera and Ficus benghalensis
For animals administration the Aloe vera and Ficus benghalensis extract was orally administrated.

Experimental induction of Diabetes
Freshly prepared solution of alloxan monohydrate dissolved in normal saline at doses of 150mg/kg body and injected intraperitoneally in to the overnight fasted mice. Forty eight hours after alloxan administration blood samples were drawn and glucose levels determined to confirm diabetes induction. The diabetic rats exhibiting blood glucose levels in range of 250 and 280 mg/dl were selected for studies.

Preparation and Administration of the Standard Drug
A standard drug used for the treatment of diabetes namely Metformin is for treatment. Freshly prepared solution were obtained by dissolving Metformin in phosphate buffer saline of 0.7 mg/dose / animal and then administered orally.

Animals
A special variety of mice inbred for experimental purposes commonly known the BALB/C mice around 6-8 weeks, weighing 23-28g. The animals were housed in ventilated plastic cages at 37± 1°C, 40 ± 10% humidity and 12-12-h light-dark cycles during the experimental period. The animals were fed with normal mouse chow and water.

Experimental design
The animals divided into four groups of four animals each and discussed as follows:
Group 1: Normal control – without any treatment. (Healthy control)
Group 2: Animals induced with alloxan (diabetic control)
Group 3: Animals induced with alloxan (induced+Aloe vera and Ficus benghalensis)
Group 4: Animals induced with alloxan (induced+standard drug metformin)

After the experimental study, the animals were sacrificed by cervical dislocation under mild chloroform anesthesia. Blood was collected by heart puncture and serum was separated by centrifugation (for 10 minutes at 3000 rpm). The serum was collected and used for biochemical studies.

Antidiabetic Activity of Aloe vera and Ficus benghalensis
Estimation of Body weight
The body weight of the mice weighted for 0, 2,4,6,8 and 10th days.

Estimation of Blood profile
Effect of Blood glucose
The blood glucose level is determined using Trinder’s method with the help of a kit. The blood collected is centrifuged and the serum is used for the experiments.

<table>
<thead>
<tr>
<th>Sl. no</th>
<th>Reagents</th>
<th>Blank</th>
<th>Test</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Glucose reagent</td>
<td>1000 μl</td>
<td>1000 μl</td>
<td>1000 μl</td>
</tr>
<tr>
<td>2</td>
<td>Serum</td>
<td>-</td>
<td>10μl</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Standard</td>
<td>-</td>
<td>-</td>
<td>10μl</td>
</tr>
<tr>
<td>4</td>
<td>Distilled water</td>
<td>10μl</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Incubated at 37°C for 5 minutes
Read absorbance at 505 nm

% Blood Glucose (mg/dl) = \frac{Absorbance of test}{Absorbance of Standard} \times 100

**Estimation of Lipid Profile**

**Effect of Total cholesterol**

The serum was collected from mice in fasting state without any anticoagulation. The following procedure was followed:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Blank</th>
<th>Standard</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum/Plasma</td>
<td>-</td>
<td>-</td>
<td>10μl</td>
</tr>
<tr>
<td>Reagent-2</td>
<td>-</td>
<td>10μl</td>
<td>-</td>
</tr>
<tr>
<td>Reagent-1</td>
<td>1000μl</td>
<td>1000μl</td>
<td>1000μl</td>
</tr>
</tbody>
</table>

Mix well. Incubated at 37°C for 10 minutes.

Total Cholesterol Conc (mg/dl) = \frac{Absorbance of test}{Absorbance of standard} \times 200

**Effect of Triglycerides**

The serum was collected from mice in fasting state without any anticoagulation. The following procedure was followed:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Blank</th>
<th>Standard</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum/plasma</td>
<td>-</td>
<td>-</td>
<td>10μl</td>
</tr>
<tr>
<td>Reagent-1</td>
<td>-</td>
<td>10μl</td>
<td>-</td>
</tr>
<tr>
<td>Reagent-2</td>
<td>1000μl</td>
<td>1000μl</td>
<td>1000μl</td>
</tr>
</tbody>
</table>

Mix well. Incubated 37°C for 10 minutes.

Triglycerides (mg/dl) = \frac{Absorbance of test}{Absorbance of standard} \times 200

**Estimation of body weight**

The antidiabetic effects of Aloe vera and Ficus benghalensis extract on the fasting Alloxan induced mice is as shown in table 1 and fig 1. Body weight was found to be significantly increasing when compared to the drug metformin with a S.D of 22.43± 1.85 to 27.11± 2.05 and p value - (P<0.05-0.01) from the 0th day to 10th day of post induction.

**Estimation of blood profile**

**Effect of Aloe vera and Ficus benghalensis extracts on serum glucose level**

The level of Aloe vera and Ficus benghalensis extracts on serum glucose level in Alloxan induced mice is shown in table 2. Glucose level was found to be significantly increasing after Alloxan administration. Administration of extract produced a significant decrease in the serum glucose value when compared to the drug metformin with range in Aloe vera- 256.2 ± 2.59 to 145.7 ± 4.89 and Ficus benghalensis 253.9 ± 2.5 to 130 ± 3.2 with P value of (<0.05- 0.01) There was nearly equal level observed between the extract treated mice and the metformin.

**ESTIMATION OF LIPID PROFILE**

**Effect of Triglycerides**

The Effect of Aloe vera and Ficus benghalensis extracts on triglycerides level in Alloxan induced mice is shown in table 3. There is extreme significant level observed between the extract treated mice and control diabetic mice. The S.D value is Aloe vera-126.40 ± 17.91 and Ficus benghalensis-123.52 ± 15.49. However, the result did not show a significant value with the drug Metformin.

Pancreas is the primary organ involved in sensing the organism’s dietary and energetic states via glucose concentration in the blood and in response to elevated blood glucose, insulin is secreted. Alloxan act as cytotoxic chemical for beta cells of the islet of Langerhans causes diabetes by inducing cell necrosis (Jorns et al., 1997). This result into decreased insulin secretion and elevated blood glucose level (Deewajee, 2008) this experimental study reveals that Alloxan-treated mice received Aloe vera and Ficus benghalensis extracts showed lower blood glucose level as compared to the diabetic control group may be due to the possibility that few of beta cells are still surviving and stimulating by extract compounds, releasing insulin.

Oral supplementation with Aloe vera has been shown to naturally stimulate production of Phase II enzymes and, in human clinical studies, increase the bioavailability and half-life of vitamins C and E in the blood. Additional studies show that Aloe supplementation can increase GSH, decrease LPO, ALP and ALT, suggesting that Aloe vera may also protect against diabetes-related hepatotoxicity (Jones-2007).

The species of genus Ficus have the most potent hypoglycemic effects. The majority of the experiments confirmed the benefits of medicinal plants with hypoglycemic effects in the management of diabetes mellitus. Numerous mechanisms have been proposed for these plant extracts. All of these actions may be responsible for the reduction of diabetic complications (Bnouham et al., 2006).
The level of serum lipids are usually elevated in diabetes mellitus and such an elevation represents a risk factor for coronary heart disease. This abnormally high level of serum lipids is mainly due to the uninhibited actions of lipolytic hormones on the fat depots, mainly due to the action of insulin. From this experimental study shows the *Aloe vera* and *Ficus benghalensis* extracts having potential to decrease the high level of lipid lipids present in blood.

Table 1. Effect of *Aloe vera* and *Ficus benghalensis* extracts on body weight in Alloxan induced mice

<table>
<thead>
<tr>
<th></th>
<th>Day 0</th>
<th>Day 2</th>
<th>Day 4</th>
<th>Day 6</th>
<th>Day 8</th>
<th>Day 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>25.53 ± 2.08</td>
<td>26.11 ± 2.23</td>
<td>26.76 ± 1.93</td>
<td>27.28 ± 1.76</td>
<td>27.83 ± 1.96</td>
<td>28.22 ± 1.96</td>
</tr>
<tr>
<td>DiabeticControl</td>
<td>21.55 ± 1.28</td>
<td>21.33 ± 1.31</td>
<td>21.59 ± 2.34</td>
<td>20.78 ± 1.69</td>
<td>20.61 ± 1.88</td>
<td>20.47 ± 2.00</td>
</tr>
<tr>
<td>DiabeticInduced+extract Aloe vera</td>
<td>22.67 ± 1.85</td>
<td>24.18 ± 2.53</td>
<td>24.83 ± 2.45</td>
<td>25.80 ± 2.63</td>
<td>26.25 ± 2.55</td>
<td>26.30 ± 2.03</td>
</tr>
<tr>
<td>Ficus benghalensis</td>
<td>22.43 ± 2.53</td>
<td>24.25 ± 2.41</td>
<td>25.55 ± 2.21</td>
<td>25.87 ± 2.00</td>
<td>26.50 ± 2.83</td>
<td>27.11 ± 2.12</td>
</tr>
<tr>
<td>Diabetic Induced+Standard</td>
<td>19.14 ± 2.35</td>
<td>18.51 ± 2.59</td>
<td>18.23 ± 2.26</td>
<td>18.33 ± 2.32</td>
<td>18.41 ± 2.29</td>
<td>18.46 ± 2.39</td>
</tr>
</tbody>
</table>

Data are expressed as mean ± S.D. Significant at P<0.05*, P<0.01** and Non-significant when compared to Standard n=4

Table 2. Effect of *Aloe vera* and *Ficus benghalensis* extracts on serum glucose level in Alloxan induced mice

<table>
<thead>
<tr>
<th></th>
<th>Day - 0</th>
<th>Day - 2</th>
<th>Day - 4</th>
<th>Day - 6</th>
<th>Day - 8</th>
<th>Day - 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>85.2 ± 2.01</td>
<td>92.5 ± 2.4</td>
<td>90.7 ± 2.2</td>
<td>88.2 ± 1.4</td>
<td>89.3 ± 1.6</td>
<td>85.5 ± 2.8</td>
</tr>
<tr>
<td>Diabetic control</td>
<td>246.2 ± 3.5</td>
<td>256.2 ± 3.4</td>
<td>240.8 ± 2.7</td>
<td>216.5 ± 5.47</td>
<td>204.5 ± 2.09</td>
<td>203.6 ± 6.12</td>
</tr>
<tr>
<td>Diabetic induced + Extract Ficus benghalensis</td>
<td>253.9 ± 2.5</td>
<td>226.7 ± 2.3</td>
<td>212.9 ± 3.57</td>
<td>198.3 ± 5.00</td>
<td>142.3 ± 5.78</td>
<td>130.4 ± 3.2</td>
</tr>
<tr>
<td>Aloe vera</td>
<td>256.2 ± 2.59</td>
<td>230.6 ± 4.67</td>
<td>219.4 ± 7.5</td>
<td>206.1 ± 6.41</td>
<td>170.6 ± 3.2</td>
<td>145.7 ± 4.89</td>
</tr>
<tr>
<td>Diabetic induced + Std (metformin)</td>
<td>258.2 ± 4.32</td>
<td>222.8 ± 2.35</td>
<td>170.2 ± 5.68</td>
<td>143.6 ± 2.7</td>
<td>132.5 ± 5.4</td>
<td>125.8 ± 3.4</td>
</tr>
</tbody>
</table>

Table 3. The Effect of *Aloe vera* and *Ficus benghalensis* extracts on triglycerides level in Alloxan induced mice

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Diabetic control</th>
<th>Diabetic induced + extracts</th>
<th>Diabetic induced + Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>87.32 ± 13.47</td>
<td>247.14 ± 22.7</td>
<td>126.40 ± 17.91</td>
<td>121.73 ± 14.8</td>
</tr>
</tbody>
</table>

Fig 1. Effect of *Aloe vera* and *Ficus benghalensis* extracts on serum glucose level in Alloxan induced mice
CONCLUSION

The results of the present study indicate that Aloe vera and Ficus benghalensis leaf extracts was found to reduce the glucose level in animals made diabetic with alloxan. Alloxan has been shown to induce free radical production and cause tissue injury it can be presumed that since mice is genotypically very similar to human beings. Therefore Aloe vera and Ficus benghalensis 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 and Ficus benghalensis extracts decreases the blood sugar level.

REFERENCES


