



Effects of aqueous leaves extract of *Aloe barbadensis* on blood glucose levels of streptozocin-induced diabetic Wistar rats

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ABSTRACT

The study was to investigate the antidiabetic of aqueous extract of leaves of plant *Aloe barbadensis*. In STZ induced diabetes in rats, a study was conducted on six groups of six male Wistar rats each to evaluate the hypoglycaemic effect. Diabetes was induced in rodents by intravenous (i.v) infusion of STZ at a portion of 50 mg/kg body weight, disintegrated in 0.01M citrate cushion (pH = 04.50). Blood glucose level was estimated utilizing GOD-POD (Kit spin react). Blood tests were pulled back from the retro-orbital plexus under light ether. *A. barbadensis* (ALEC) was exposed to hostile to diabetic action in rodents where STZ was utilized as a portion of 120 mg/kg in intraperitoneal portion as a diabetogenic specialist to an acquainted diabetic with test rodents. In intense streptozotocin prompted models fasting blood glucose level was recorded on multi-day as basal worth 4th, 7th and 10th day. Aqueous extracts of leaves of *A. barbadensis* at portion 250 and 500 mg/kg showed portion subordinate critical enemy of hyperglycemic action on 4th, 7th and 10th day post-treatment. ALEC portion of 100 mg/kg likewise caused a decrease in blood glucose level; however, outcomes were found factually non-noteworthy. The Antihyperglycemic impact of fluid leaves concentrate of *A. barbadensis* at portion 100 mg/kg was discovered less viable than reference standard medications glibenclamide. The most extreme decrease was seen on the 10th day of the greatest portion of 500 mg/kg ALEC. Glibenclamide produces a critical decrease in blood glucose level in contrast with diabetic control. Glibenclamide was used as a standard drug, and the results were compared in reference to it. The study confirmed the aqueous extract of *Aloe barbadensis* has significant and sustained oral hypoglycaemic activity, comparable with the hypoglycaemic effect of glibenclamide, a sulfonylurea derivative.



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INTRODUCTION

Diabetes Mellitus (DM) is a main metabolic complaint and the most shared of the endocrine illnesses [1]. It is assessed that there are presently 285 million people worldwide, and this number is set to rise to 438 million by the year 2030 [2]. India has the peak number of patients with known diabetes worldwide, with a prevalence of 11.6%. Most of these cases will be type 2 diabetes, which is intensely related with a sedentary routine and high calorie-nutrition and obesity [3]. Based on the etiology, type 1 may be due to immunological

destruction of pancreatic β cells resulting in insulin deficiency [4]. Type 2 DM is associated with both impaired insulin secretion and insulin resistance. Type 2 DM is a more prevalent form of the disease and is common in individuals over 40 years of age. It is often associated with obesity and hereditary disposition [5].

More than 1200 plants species are world wild use in diabetes phytotherapy, and investigational studies support the hypoglycaemic activity of a large number of these plants. In addition to improvement of blood glucose levels, several hypoglycaemic plants are potential in ameliorating lipid metabolism irregularities of diabetes mellitus [6]. Therefore, the study of plant hypoglycaemic activities of aqueous and alcoholic extract may give a new pharmacological line in the treatment of diabetes mellitus [7]. Despite vast research efforts, the nature of the defect has been problematic to determine. In some patients, the insulin receptor is abnormal; in others, some aspects of insulin signaling is defective, and in others, no defect has been identified. Significantly, the disease is usually controlled through nutritional therapy, workout and hypoglycaemic agents [8]. Several plants were having controlling hypolipidemic properties because of the quality of Flavonoids; Phenolic mixes, just as certain glycosides were accounted for to have against hyperlipidemic property [9].

Aloe vera (*A. barbadensis*), enduring succulent xerophyte, taking place with a group of Liliaceae. The Sanskrit name of Aloe vera, i.e., Kumari, truly signifies 'young lady'. Aloin is broadly used to direct the menstrual stream. According to Ayurveda, it conciliates Apana vata, which controls the monthly cycle [10]. It has hostile to uncontrollable property that diminishes menstrual inconvenience. The phytochemical screening of aqueous leaf extract of *A. vera* plant has uncovered nearness of alkaloids, anthraquinones, phenols, saponins, sugars, starch, glucose, amino acids, proteins, cell reinforcements and cancer prevention agent chemicals demonstrating nearness of pharmacologically significant phytochemicals [11]. Aloe vera has additionally been appeared to have antidiabetic and hypoglycemic properties [12]. Oral organization of Aloe vera may be valuable subordinate for bringing down blood glucose in diabetic patients just as for diminishing blood lipid levels in patients with hyperlipidemia [13].

MATERIALS AND METHODS

Plant material

The leaves of Aloe were collected around the local

area. The leaves were dried under shade subjected to the soxhlet extraction procedure. The dried leaves extracts were freshly re-dissolved in normal saline and given to animals.

Animals

Male Wistar Rodents of either sex weighing 150-200g were used for STZ-induced anti-diabetic activity. All animals were fasted for 72 hours before the experiments. Each experimental group consisted of five animals housed in separate cages.

Experimental design

In the experiment, the rodents were divided into 6 groups of 6 rodents each.

Group I – Normal control rodents;

Group II – STZ treated control rodents (120 mg/kg b. wt);

Group III – STZ + standard medication Glibenclamide (5 mg/kg b. wt);

Group IV – STZ + aq. extract of *A. barbadensis* (100 mg/kg b. wt);

Group V–STZ +aq. extract of *A. barbadensis* (250 mg/kg b. wt);

Group VI–STZ + aq. extract of *A. barbadensis* (500 mg/kg b.wt).

Induction of diabetes

Streptozotocin is genuinely happening structured that is predominantly perilous to insulin passing on B-cells of the pancreas in all around bleeding edge animals. It is used as a bit of solution for curing positive tumor of islet and utilized piece of strong assessment to pass on creature model for class 1 diabetes and has mol mass of 265.20 g/mol. It is assessment is $C_8H_{15}N_3O_7$. Streptozotocin is a bizarre aminoglycoside containing nitrosoamino bunch found in 1959 as anti-toxin, presently promoted as conventional medication. Streptozotocin is broadly used to actuate diabetes in rat models by restraint of β -cell O-GlcNAcase [14].

Diabetes was actuated in rodents by intravenous (i.v) infusion of STZ at a portion of 50 mg/kg body weight, disintegrated in 0.10M virus citrate cushion (pH = 04.50) [15]. Blood glucose level was estimated utilizing GOD-POD (Kit spin react). Blood tests were pulled back from the retro-orbital plexus under light ether.

Exploratory convention typical rodents and those with hyperglycemia (blood glucose 0.200-0.360 g/dl) were separated into 06 gatherings of 06 creatures each and treated by per oral. Blood tests and body weight were estimated at week after week

interims on days 0, 04, 07, and 10, till the finish of the study. Blood glucose levels were estimated utilizing GOD-POD (Kit spin react) (Trinder, 1996). Body weight additionally saw during investigation time [16].

Determination of blood glucose levels

Acute treatment was performed for 10 days. Furthermore, sub adorable treatment was done at 1 month. Toward the finish of the 30th day’s treatment, blood glucose level was assessed by one touch glucometer and rodents were yielded under chloroform sedation. Blood was gathered and centrifuged at 3000 rpm for 20 minutes to isolate serum. The liver was expelled and washed with super cold typical saline (00.90 %) to evacuate the blood.

Around 1 g of liver tissue was homogenized utilizing 00.10 M Tris – HCl cushion at pH 04.70 and the supernatant was isolated. Serum and supernatant were utilized to break down natural parameters inside 01 day of penance. The above strategy are followed for sub intense treatment gathering. For sub intense gathering, blood tests were gathered on the 30th day of treatment [17].

Statistical analysis

Blood glucose levels for each group were expressed in mg/dl as mean ± SEM. The data were statistically analyzed using ANOVA with multiply comparisons versus a control group.

RESULTS

Phytochemical Study

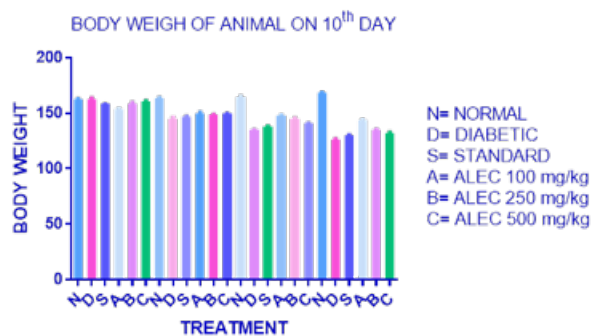
In Preliminary phytochemical examination of fluid leaves, concentrate of *A. barbadensis* showed positive subjective test for tannins, phenols, flavonoids quercetin and starches. Tests for proteins are negative, saponin additionally discovered missing in aqueous extract and isolation was finished by HPTCL.

Acute Toxicity Studies

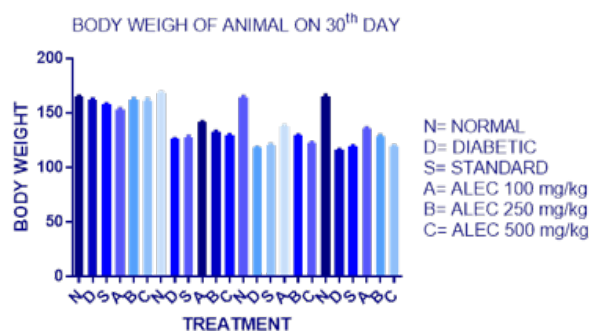
In the current examination, creatures utilized were permitted to get to ordinary nourishment and water admission. Tangible movement, engine action, refluxes and skeletal muscle action was likewise ordinary in all examination creatures. There is no noteworthy impact on body weight was watched. All rodents were ordinary all through examination, and no mortality was observed following 14 day of the test period.

Antidiabetic Studies

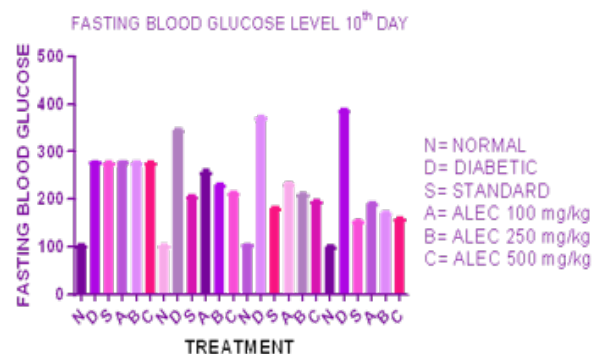
Impact of watery leaves concentrates of *A. barbadensis* on body weight in diabetes rodent in streptozo-



Graph 1: Effect of ALEC on body weight in STZ induced acute diabetic rat model

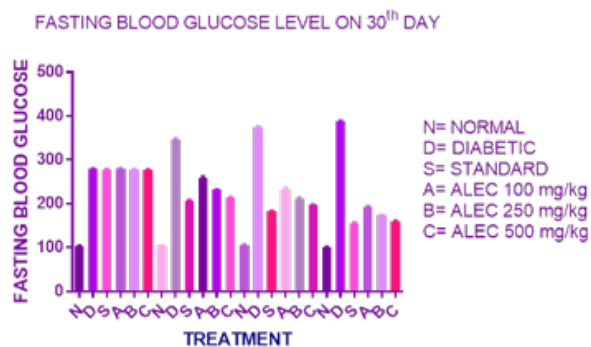


Graph 2: Effect of ALEC on body weight in STZ induced sub acute diabetic rat model



Graph 3: Effect of ALEC on Fasting blood glucose level in STZ induced acute diabetic rat model

tocin incited rodent model. Typical control creatures were seen as steady in their body weight, yet diabetic rodents demonstrated a huge decrease in body weight during 10 long stretches of treatment with ALEC. Streptozotocin intervened body weight decrease was critical turned around by watery leave concentrate of *A. barbadensis* in portion subordinate design. Impact of test remove at portion 100 mg/kg on body weight of creature was found measurably not noteworthy.



Graph 4: Effect of ALEC on Fasting blood glucose level in STZ induced sub-acute diabetic rat model

However, a portion of 500 mg/kg was found to be factually critical with contrast with diabetic control.

Impact of watery leaves concentrates of *A. barbadensis* on body weight in diabetes rodent in streptozotocin initiated rodent model. Typical control creatures were seen as steady in their body weight; however, diabetic rodents indicated a huge decrease in body weight during 30 long stretches of treatment with ALEC. Streptozotocin intervened body weight decrease was huge turned around by fluid leave concentrate of *A. barbadensis* in portion subordinate design. The impact of test separate at portion 100 mg/kg on body weight of creature was found factually not huge. Be that as it may, a portion of 500 mg/kg was found to be factually critical with contrast with diabetic control (Graph 1, Graph 2).

Hostile to the diabetic movement of fluid leaves concentrate of *A. barbadensis* (ALEC) in rodents where Being more specifically dangerous to beta-cell than alloxan STZ was utilized for the enlistment of diabetes mellitus in test creatures. STZ was utilized as a portion of 50 mg/kg in intra peritoneal portion as a diabetogenic specialist to an acquainted diabetic with test rodents. Streptozotocin is offered orally to make creature diabetes.

In intense streptozotocin prompted models fasting blood glucose level was recorded on the multi-day as basal worth 4th, 7th and 10th day. Aqueous extracts of leaves of *A. barbadensis* at portion 250 and 500 mg/kg showed portion subordinate critical enemy of hyperglycemic action on 4th, 7th and 10th day post-treatment. ALEC portion of 100 mg/kg likewise caused a decrease in blood glucose level; however, outcomes were found factually non-noteworthy. Counter hyperglycemic impact of fluid leaves concentrate of *A. barbadensis* at portion 100 mg/kg was discovered less viable than reference standard medications glibenclamide. The most extreme decrease was seen on 10th day of the great-

est portion of 500 mg/kg ALEC. Glibenclamide produces a criticalness decrease in blood glucose level in contrast with diabetic control. glibenclamide teated gathering anyway demonstrated a critical decrease in mean fasting glucose at all-time focuses. A destining blood glucose level of all rodents treated with *A. barbadensis* came back to basal level on 10th day. Rodents treated with glibenclamide as standard oral hypoglycemic medication stayed underneath basal level on 10th day. A portion of 500 mg/kg was found to be factually critical with contrast with diabetic control (Graph 3, Graph 4).

Histopathology

Aqueous extracts of leaves of *A. barbadensis* when regulated (100, 250 and 500 mg/kg b.w) to rodents demonstrated islet structure with hardly any incendiary cells at a portion of 100 mg/kg b.w while at a portion level of 500 mg/kg b.w indicated not many fiery cells in the islet of the pancreas. From histopathology, it affirmed that changes of tissue treated with high fat kicked bucket are recouped by utilized of watery leaves concentrate of *A. barbadensis*. As the same as simvastatin. Simvastatin is utilized as standard medications. (Figure 1) Shows that, A- Control liver (Nhp: Normal hepatocytes), B- Diabetic liver (STZ treated) (Dhp: Damaged hepatocytes), C- Glibenclamide treated liver (Standard Drug), D, E, F- *A. BARBADENSIS* treated liver (Rhp: Recovered hepatocytes), Histopathology of Pancreas.

DISCUSSION

Aqueous extracts of leaves of *A. barbadensis* were assessed for, and SZT initiated diabetics in rodents. Extraction and starter phytochemical investigations of *A. barbadensis* uncovered nearness of Flavonoids, glycosides alkaloids, Carbohydrate and Tannins. While saponin and proteins gives negative outcomes. An acute oral poisonous quality investigation was performed to discover the test portion as indicated by OECD 425 rules, and watery leaves concentrate of *A. barbadensis* was seen as protected at a portion of 2000mg/kg body weight. streptozotocin (50 mg/kg i.p) were utilized to actuate diabetic in pale-skinned person rodents. Glibenclamide (10 mg/kg, i.p) was utilized as standard. Aqu-check glucometer was utilized to gauge blood glucose, though, for estimation of different parameters, blood tests were gathered from retro-orbital plexus. Glucose take-up by separated rodent hemi-diaphragm.

All these perceptions bolster discoveries that aqueous extracts of leaves of *A. barbadensis* had the option to offer critical insurance in treatment gatherings while glibenclimide utilized as standard

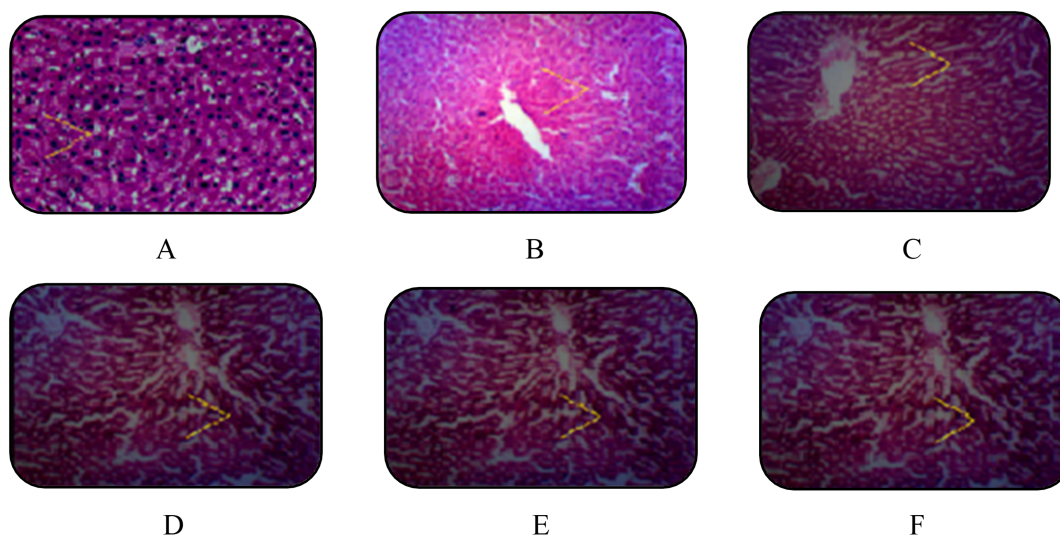


Figure 1: Histopathology of liver in STZ induced diabetes rat model after treatment with ALEC in a different dose

medications. In all animals, gatherings of STZ initiated diabetic Mellitus has been examined.

CONCLUSIONS

The results indicate that the study compound aqueous extract of *Aloe barbadensis* has significant and constant oral hypoglycemic activity, comparable with the hypoglycemic effect of glibenclamide, a sulfonylurea derivative. The anti-diabetic result may be due to increased insulin secretion. By utilizing the vast reserves of phytotherapy, we can reduce the economic burden, especially in poor & developing countries.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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