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Hypoglycemic Activity of Ethanolic Extract of Aloe Vera In Control And Diabetic Mice

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ABSTRACT

Herbal medicines are frequently considered to be less toxic and have fewer side effects than synthetic ones. Hence, the present study was designed to evaluate hypoglycemic activity of Aloe vera. Diabetes mellitus was induced by single intraperitoneal injection of alloxan 120 mg/kg body weight. Ethanolic extract of Aloe vera was administered intraperitoneally 300mg/kg body weight in diabetic mice. The treatment effects were compared with standard antidiabetic drugs insulin 1IU/kg body weight. A significant decrease in blood glucose level and improvement in the body weight was observed. The observed hypoglycemic activity could be associated with the phytochemicals present in this plant extract. Therefore, the result suggests that Aloe vera leaf extract is potent hypoglycemic agent.

Keywords: Aloe Vera, Hypoglycemia, Intraperitoneal Diabetes Mellitus, Alloxan

I. INTRODUCTION

Diabetes mellitus is one of the most challenging metabolic disorder of 21st century which affects essential pathways in the body such as carbohydrate, protein and lipid metabolism (Karau et al., 2012). It leads to hyperglycemia resulting from a defect in insulin secretion, or insulin resistance in the peripheral tissues or both (Ansarullah et al.,2011). The classical symptoms of hyperglycemia viz poluuria, polydipsia, polyphagia and weight loss (Chan et al., 2009).It is assumed that in 2030 the number of diabetic patient will increase to 439 million which was 285 million in 2010 (Shaw et al.,2010).India has been declared as "Diabetic Capital of the World" by the International diabetes federation because 20% of the total diabetic patients in the world found in India. It is evident that this disease leads to hyperglycemia and to many other complications such as hyperlipidemia, hypertension, atherosclerosis, retinopathy and neuropathy (Anfenan, 2014). The oral hypoglycemic drugs glyburide, metformin, glimepiride and poglitazone are basic drugs for diabetes mellitus (Bandawane et al., 2011).These hypoglycemic drugs putforth serious side effects especially gastrointestinal discomfort, nausea and metallic taste (Vishakarma et al., 2010). Ethnobotanical information indicates that more than 800 plants are used as traditional remedies for the treatment of diabetes (Pushparaj et al.,2000). Only few have received scientific scrutiny. Aloe vera can be mentioned as a plant of considera ble interest.

Aloe vera belongs to the Xanthorrhoeaceae family. It is a cactus like plant, grows in hot dry climates and currently, because of demand it is cultivated in large quantities (Grieve, 1975). This herb used internally to fight again poor appetite, colitis constipation, digestive problem.

Thus the present study is designed to study hypoglycemic activity of Aloe vera in alloxan induced diabetic female mice.

II. METHODS AND MATERIAL

Preparation of Aloe vera leaf extract The fresh A.vera leaves (Voucher specimen: KJS-1) were washed thoroughly with water, peel was removed and only pulp was collected. The pulp was lyophilized. Extraction of lyophilized material was carried out by soxhlet method (Aswar et al.,2011). The extract obtained was dried at 370 C in oven. The obtained yield was stored in refrigerator at 80C until further use. The residual extract was resuspended in distilled water and used in study as per desired concentration when needed.

Animals

Healthy adult female mice (Mus musculus Linn.) were used for present investigation. Mice were obtained from (Rajarambapu College of Pharmacy, Kasegao, Sangali). Adult female mice (4 month age) 28 ±2 were selected. All the animals were kept under a 12:12 hr L:D cycle. The animals were housed in aluminium cages and allowed to live in groups of 3-4 animals per cage. They were fed with Amrut mice feed, marketed from Pranav Agro Industries, Pvt. Ltd. Sangli and water ad libitum. Animals were divided into four groups.

Experimental design

Female mice were divided into four groups containing 6 animals per group.

Control group: Female mice were given intraperitoneal injection of 0.15 M Acetate buffer PH 5.4 for 15 days.

Diabetic group: Female mice were given single intraperitoneal injection of alloxan 120 mg/kg body weight (Fayed et al.,1988; Helal,2000 and Syiem et al.,2002).

Recovery group: Female mice from diabetic group were given intraperitoneal injection of A. vera leaf extract at dose of 300 mg/kg body weight once a day for 15 days (Rjasekaran et al.,2004).

Diabetic + Insulin group: Female mice from diabetic group were given intraperitoneal injection of Insulin 1IU/kg body weight (Rajesh Mandade, 2012).

Determination of blood glucose level

Fasting blood glucose was measured by collecting a drop of blood from the tail after incision with a sharp blade. The blood glucose was determined by using a rapid glucose analyzer with a glucose strip inserted in sugar scan digital blood glucose monitoring glucometer. The result was expressed in terms of milligram per deciliter of blood (Kumar et al., 2006).

Determination of body weight

Animals from each group weighed before starting experiment, animals from control, diabetic and recovery group and insulin treated group. The record of these observations was maintained.

Statistical analysis

The data was statistically analyzed by One way ANOVA followed by Tukey HSD test. All the values were expressed as mean ± S.E. The difference was considered significant when $p<0.001$

III. RESULTS

Table 1: Showing blood glucose level (mg/dl) in control and experimental adult female mice.

Values are mean ± S.E. Number in parenthesis denote number of animals. P< 0.01 = significant, P< 0.001 = highly significant.

Sr. No.	Animal group (n=6)	Adult female mice	
		Blood glucose level (mg/dl)	Statistical significance
I.	Control group	85 ± 2.91	1:2, P<0.01
II.	Diabetic group	220.2 ± 1.92	2:3, P<0.01
III.	Recovery group	124.6 ± 13.39	2:4, P<0.01
IV.	Diabetic + Insulin group	121.4 ± 7.4	3:4, P<0.01

Table 2: Showing body weight (gm) in control and experimental adult female mice.

Values are mean ± S.E. Number in parenthesis denote number of animals. P< 0.01 = significant, P< 0.001 = highly significant.

Sr. No.	Animal group (n=6)	Adult female mice	
		Body weight (gm)	Statistical significance
I.	Control group	28.6 ± 1.14	1:2, P<0.01
II.	Diabetic group	23 ± 1.58	2:3, P<0.01
III.	Recovery group	26.6 ± 1.1	2:4, P<0.01
IV.	Diabetic + Insulin group	27.8 ± 1.3	3:4, P<0.01

The initial body weight in the adult female control group was evaluated to be 28.6 ± 1.14 gm (1:2, p < 0.01) whereas it as 23 ± 1.58 gm in diabetic group. After the treatment of diabetic mice with A. vera (300 mg/kg body eight) the body weight it was found significantly increase to 26.6 ± 1.1 gm (2:3, p < 0.01) while highest weight gain was observed in insulin treated group 27.8 ± 1.3 gm (2:4, p< 0.01).These data shown that the effect of A.vera on weight gain was intermediate to insulin.

The mean level of blood glucose in the adult female control group was observed to be 85 ± 2.91 mg/dl (1:2, p < 0.01) whereas it was 220.2 ± 1.92 mg/dl in diabetic group. After the treatment of diabetic mice with A.vera (300 mg/kg body weight) the blood glucose level found significantly decrease to 124.6 ± 13.39 mg/dl (2:3, p < 0.01) while highly decreasing blood glucose level was observed in insulin treated group 121.4 ± 7.4 mg/dl (2:4, p < 0.01). These data shown that the effect of A. vera on blood glucose level was intermediate to insulin.

IV. DISCUSSION

Diabetic mellitus is a complex metabolic disease caused by defect of insulin signaling pathways which show the defect from pancreatic β-cell deficiency (Kahn, 1994). Scientists are in search of easily available, inexpensive therapeutics, having minimum side effects for better treatment (Manna et al., 2010).
In the present study alloxan was used for induction of diabetes. Our results are similar to previous findings (Jain et al., 2011). Alloxan selectively destroy pancreatic cell, after being taken up by the pancreatic cells via GLUT-2 glucose transporters, alloxan produces reactive oxygen species in a cyclic redox reaction with its reduction product, dialuric acid, superoxide radicals hydrogen peroxide and hydroxyl radicals which are responsible for the death of the β-cells (Lensen, 2008; Muhtadi et al.,2015). However, the exact mechanism after treatment of plant not yet

known. According to literature hypoglycemic action of plant extract might be enhanced insulin secretion, increase peripheral glucose uptake or decrease counter regulatory hormone like cortsol, glucagon and growth hormone (Abunasef et al.,2014).

Body weight is an indicator of good health and efficient metabolic homeostasis, body weight before and after commence of experiment, showed that alloxan –induced diabetes resulted in a significant decrease in body weight with respect to control group, which was in accordance with previous reports (Komolafe et al., 2009; Sharma et al., 2013; Singh et al., 2016). Loss of weight has been one of the symptom of diabetes mellitus (Sellamuthu et al., 2009). Weight loss associated with diabetes may be due to increased muscle wasting and loss of tissue proteins (Kato et al.,2008; Nagwa et al, 2017). Deficiency of insulin in the diabetic mice lead to decreased amino acids at the level of protein synthesis (Mohamed et al., 2013). Glycosuria is known to cause a significant loss of calories which result weight loss inspite of increased appetite.These event related to insulin deficiency. In the present investigation treatment of A. vera groups tend to gain weight. This weight gain in diabetic groups showed that weight loss prevented by interaction of several bioactive compounds. Treatment allowed to access the glucose both to supply energy and spared some to build tissue require for growth by decreasing metabolic rate and glycosuria.

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