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Aqueous extract of Cynodon dactylon may be an effective option with reduced risk of side effect for the treatment of Diabetes Mellitus

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Abstract
Though different types of oral hypoglycaemic drugs are available along with insulin for the treatment of type-2 Diabetes Mellitus, but they have significant side effects and sometimes they are found to be ineffective in chronic diabetic patients. Thus, there is an increasing demand of natural products with high antidiabetic potential and lesser side effects. Among these aqueous extract of Cynodon dactylon (Doob Grass) has been used as an antidiabetic agent in traditional system of medicine in India. The aim of this study is to investigate the antidiabetic effect of aqueous extract of Cynodon dactylon in streptozotocin induced diabetic albino rats. For this purpose, experimental rats were divided into three groups: Group A, B and C namely; normal control, diabetic control and diabetic rat treated with aqueous extract of cynodon dactylon (500 mg/kg body wt.) respectively. Animals were subjected to induce diabetes by intraperitoneal injection of a single dose of 50 mg/kg body weight of streptozotocin. Animals with moderate hyperglycemia, i.e. serum glucose between 200-350mg/dl were taken into consideration for administration of aqueous extract of Cynodon dactylon. The whole experiment was performed for a period of 28 days. Our result concludes that aqueous extract of cynodon dactylon is able to reduce the fasting blood sugar in diabetic rats, and that the rate of fall of FBS was more in 3rd week of study while later in 4th week it achieves almost to normal range.
Keywords: *Antidiabetic effect, aqueous extract, Cynodon Dactylon, Streptozotocin induced diabetic rats.*

Introduction

Diabetes Mellitus (DM) is a dreadful affliction,[1] characterised by polyuria, polydipsia and polyphagia with generalised fatigue and wasting of the body[2] Life is short, unpleasant and painful, thirst unquenchable, drinking excessive and disproportionate to the large quantity of urine, for yet more urine is passed.[3] As the disease

progresses, there is tissue or vascular damage leading to severe diabetic complications such as retinopathy, neuropathy, nephropathy, cardiovascular complications and ulceration.[4] India has a huge burden of diabetics in the diabetic map of the world as well as being the diabetes capital of the world.[5] Changes in human behaviour and lifestyle over the last century have resulted in a dramatic increase in the prevalence of type 2 diabetes mellitus.[6,7] As such, four in every five diabetics are between 40 and 59 years.[8,9] By 2030, it is expected that one in every 10 adults will have diabetes. Though different types of oral hypoglycaemic drugs (sulfonylurea: glimepiride) are available along with insulin[10] for the treatment of type-2 Diabetes Mellitus, but they have significant side effects[11,12] and sometimes they are found to be ineffective in chronic diabetic patients.[13] Thus, there is an increasing demand of natural products with high antidiabetic potential and lesser or no side effects.[14] Among these, aqueous extract of *Cynodon dactylon (Doob Grass)*[15] has been used as an antidiabetic agent in traditional system of medicine in India.[16] The aim of this study is to investigate the antidiabetic effect of aqueous extract of Cynodon Dactylon in Streptozotocin induced diabetic albino rats.

Materials and Methods

The present work was conducted in the Postgraduate Laboratory of the Department of Pharmacology and Therapeutics of tertiary care centre after ethical approval from the Institutional Animal Ethics Committee(IAEC) Guidelines.

Animals

The experiment was performed on a total of 18 apparently healthy male wistar rats weighing between 180-200 grams. The animals were kept at controlled laboratory conditions (22±2°C, 55±5% RH, and equal dark-light cycle, acclimatization period: 1 week).

Induction of Diabetes Mellitus

The experimental animals were subjected to induce diabetes by intraperitoneal injection of a single dose of 50 mg/kg body wt. of streptozotocin. Rats with serum glucose levels > 200 mg /dl were considered to be diabetic.

Experimental design

The animals were subdivided into three equal groups (group A, B, and C) randomly selecting 6 rats in each group. Group A were remained normal control rats not induced diabetes and treated with vehicle i.e. 1% gum acacia. Group B were diabetic control rats that were induced diabetes and treated with vehicle i.e. 1% gum acacia. And, group C were diabetic rats that were treated with aqueous extract of cynodon dactylon. The whole experiment was carried out for a period of 28 days. The fasting blood samples were collected from all groups.

Estimation of fasting blood sugar

For the estimation of fasting blood sugar, blood samples were collected from the tail vein of the rat. And, the reading of fasting blood sugar was recorded with the help of glucometer before induction of diabetes as well as after induction of diabetes on days 0, 7, 14, 21 and 28.

Statistical Analysis

Statistical analysis of data was carried out by employing analysis of variance (Snedecor and Cochran, 1967). One way ANOVA test was used to compare the effect of drugs on different group. Tukey's HSD test was used for post-hoc analysis of significant overall differences.

Result

Table-1 showing sequential changes in FBS among three groups on 0, 7th, 14th, 21st and 28th day. All the values are expressed in mean± standard deviation

	Group A	Group B	Group C
Day 0	88.33±5.58	294.33±10.83	280.34±11.48
Day 7	87.34±3.72	301.67±7.08	252 ±8.27
Day14	92.67±4.32	306.67±4.84	205.16±3.92
Day21	97.67±3.45	311.67±5.99	134.67±3.26
Day28	86.67±4.13	307.33±8.45	114.34±4.64

Group A=Normal Control
Group B=Diabetic Control
Group C=Diabetic rats treated with aqueous extract of cynodon dactylon

Figure-1 shows the group wise changes in FBS with time in the entire duration of experiment

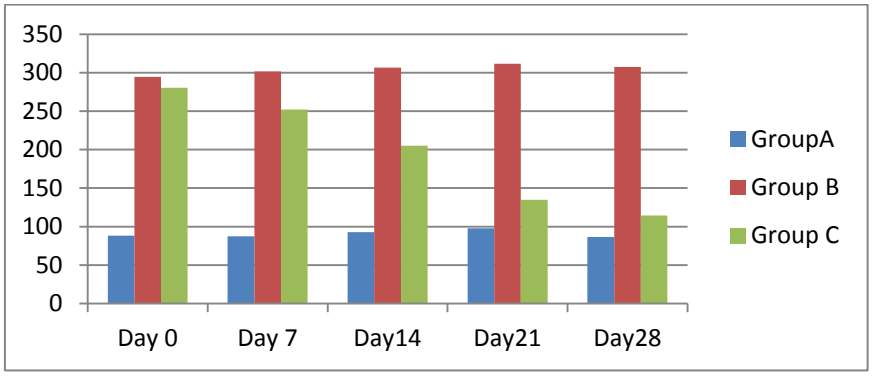
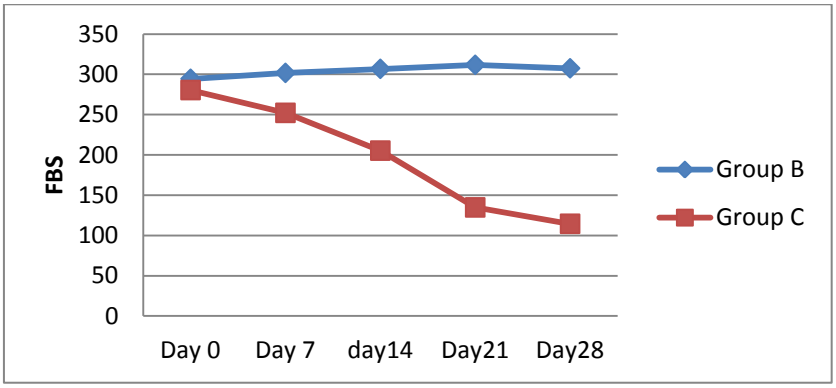


Table-2: Effect of aqueous extract of cynodon dactylon on FBS in diabetic control and experimental animals.

	Group B	Group C	Difference in Mean	Significance
Day 0	294.33±10.83	280.34±11.48	14.00	0.000*
Day 7	301.67±7.09	252±8.27	49.66	0.000*
Day14	306.67±4.84	205.16±3.92	101.50	0.000*
Day 21	311.67±5.99	134.67±3.26	177.00	0.000*
Day 28	307.33±8.45	114.34±4.64	193.00*	0.000*

Figure-2 Comparing the day-wise value of FBS in Group B and Group C



Discussion

It is apparent from the table 1 and figure 1 that fasting blood sugar in group A rats vary between 86 to 97 mg per dl. This is the normal FBS level for the rats and this serves as the target level to achieve good glycemic control. Group B rats were diabetic control that was given only vehicle as a treatment. This group shows very high FBS that increase as the day progresses during the entire treatment period. Group C rats that were induced diabetes and administered aqueous extract of cynodon dactylon in 1% gum acacia for the entire duration of experiment, shows very high FBS on day 0 and on day 7, 14,21and 28, the FBS gradually decreases. Here the decline in FBS was 10% on day 7, 19% on day 14, 35% on day 21, and on day 28, decline was around 15%. Table 2 compares the FBS in diabetic control group with aqueous extract of cynodon dactylon treated group. FBS values between group B & C were significant on day 0, 7, 14, 21and 28. Figure 2 depicts the graphic representation of FBS values on day 0, 7, 14, 21 and 28. Slope of the graph indicates the rate of fall in FBS during the study period. It is clear from the graph that the rate of fall of FBS was more in 3rd week of study while later in 4th week it achieves almost to normal range.

There are various oral hypoglycemic agents, such as insulin secretagogue like sulfonylurea, insulin

sensitizer: pioglitazone and metformin, α glucosidase inhibitors like acarbose, amylin agonist (Pramlintide), GLP-1 analog (Exenatide) and Inhibitor of Dipeptidyl peptidase-4 (Sitagliptin) are available along with insulin for the treatment of diabetes mellitus but they have significant side effects, and sometimes they are found to be ineffective in chronic diabetic patients. Thus, there is an increasing demand of natural product with high antidiabetic potential and lesser side effects. Among these Cynodon dactylon is a herbal shrub easily available, abundant in our region, very economical and easily recognisable having antidiabetic potential with lesser side effect. It has been observed from previous researches that presence of various bioactive ingredient like flavonoids and sterols[17]in cynodon dactylon is responsible for its antidiabetic properties[18] as well as known for their ability of beta cell regeneration of pancreas.[19]

Since ancient times, diabetes has been treated orally with several medicinal plants or their extracts. So, herbal remedies such as Cynodon dactylon is apparently effective, produces minimal or no side effects and is of relatively low costs as compared to oral synthetic hypoglycemic agents.

Conclusion

Since ancient times, diabetes has been treated orally with several medicinal plants or their extracts. On the basis of outcome of the above study as well as from previous researches it has been observed that herbal remedies such as Cynodon dactylon because of its important bioactive ingredient like flavonoids and sterols, is apparently effective, produces minimal or no side effects and is of relatively low costs as compared to oral synthetic hypoglycemic agents. Thus, it has been concluded that aqueous extract of Cynodon dactylon may be an effective option with reduced risk of side effect for the treatment of Diabetes Mellitus.

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