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RESEARCH ARTICLE

Anti-Diabetic Activity of Polyphyto Combination in Alloxan induced Diabetic Rats

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ABSTRACT

Diabetes mellitus is a metabolic disorder of carbohydrate, protein and fat which are characterized by hyperglycemia, polyuria, polydipsia, and polyphagia which is deficient insulin production or ineffectiveness in insulin actions. There are two major types of diabetes Type 1, type 2, gestational and other specific type's secondary diabetes). The present study was aimed to evaluate the anti diabetic potency of polyphyto combination (FD18) on the blood glucose level in alloxan induced diabetic rats. Diabetic Albino wistar strain rats were treated with standard drug glibenclamide and test drug FD18 at 100mg. Hypoglycemic effect was determined in the rats and the efficacy of the test drug was compared to the standard drug Glibenclamide. FD18 was orally administered for 14days in alloxan induced diabetic rats. At the end of the study duration blood glucose level and body weight were statistically analyzed. Based on these results of the study this poly phyto combination produced a significant reduction in blood glucose levels and slight increase in the body weight when compared with diabetic control rats. And hence the present research work proved that the polyphyto combination possess hypoglycemic effect.

KEYWORDS

Diabetes Mellitus, Alloxan, Glibenclamide, Polyphyto Combination, Blood Glucose Level, Body Weight, Anti-Diabetic Activity

INTRODUCTION

Diabetes mellitus (DM) is a most common disorder of endocrine gland which is caused due to deficiency in insulin production or ineffectiveness of insulin produced [1]. So this a deficiency of insulin result in improper metabolism of glucose which have harmful effect in the body system, in particular the blood vessels and nerves[2]. Diabetes affects more than 171 million people worldwide and according to the resent study, this population may be increased 366 million by 2030[3].

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If diabetes is not controlled by medicine it will affect the internal organs such as nephropathy, neuropathy, retinopathy etc.[4]. Although different types of oral hypoglycemic agents are available along with the insulin for diabetes treatment, there is a growing trend in herbal treatment due to the side effects occurring with allopathic medicines[5]. Plants are always been good resources for drugs and many of the currently available medications are directly or indirectly derived from plants. Most of the products obtained from plants are reported to possess antidiabetic activity and which are widely prescribed. As they are effective, have less side effects and low cost[6,8]. Hence was made to determine the anti diabetic potential of

polyphyto combination (FD18) on the blood glucose level in alloxan induced diabetic rats.

MATERIALS AND METHOD

The plant parts used in the polyphyto formulation are Cinnamomum zeylanicumm (bark) 2gm, Astragalus gumifer (gum) 2gm, Murraya koenigii (leaves) 2gm, Ocimum sanctum (leaf) 4gm, Musa paradisica (stem) 10gm, Paspalum scrobiculatam (seed) 10gm, Plantago ovata (husk) 20gm and Avena sativa (seed) 50gmwere collected from in and around Dehradun district of Uttarakhand. These plants were identified and authenticated by Prof (Dr.) R. C. Dubey, Department of Botany and Microbiology, Gurukul Kangri, Vishwavidyalaya, Haridwar.

The vouchers of specimen samples of the various plants were kept in the department for reference. The collected part of the plants was cleaned properly with water and was subjected to shade drying for about 8 weeks. The dried plant material was further crushed to powder and sieved (through 100 mesh) to obtain fine powder.

Each of the powders was taken in different proportions as per quantity required for the formulation and thoroughly mixed together by geometrical mixing to get a homogenous mixture, stored in air tight container which was used for the study.

Animals

Healthy Wistar albino rats weight 150-200g selected by random sampling technique were used in the study. The rats were acclimatized for one week in the animal house facility. They were housed in polypropylene cages at an ambient temperature of 25±1°C with a natural dark-light cycle[9].

They had free access to standard pellet diet and water given. The rats were fasted overnight before the starting the study but had free access for water. All experiments were conducted in day time (9:30 AM to 5:00 PM). The study was approved by Institutional Animal Ethical committee (CPCSEA registration no. 1156/AC/07/CPCSEA).

Induction of Diabetes with Alloxan[10]

Diabetes was induced in rats by giving intraperitonial injection of single dose (85mg/kg) of freshly prepared alloxan monohydrate dissolved in saline solution. They were given 5% of glucose in drinking water after 1 hr to encounter any initial hypoglycemia. After 72 hrs the animals were checked for blood glucose level, those with higher than 250mg/dl were considered diabetic and used for the study.

Blood Glucose Determination

Blood was obtained by snipping tail with the help of sharp razor. Blood glucose level was monitored by using Accu-Chek Active glucose monitoring kit. Each time the tail of the rats was sterilized with spirit.

Experimental Design

The selected diabetic rats were divided randomly into four groups with six animals in each group.

Group 1: Normal control received normal saline solution for 14 days

Group2: Diabetic control received normal saline solution for 14 days

Group 3: Diabetic rats treated with standard drug glibenclamide (4 mg/ kg) orally for14 days.

Group 4: Diabetic rats given FD18 (100 mg/kg) orally for 14 days.

The administration of the trial drug and standard drugs were carried out every day for 14days. Blood samples were collected through the tail vein just prior to and on days 14 after the drug administration and reduction in blood glucose was estimated by using glucometer and compared.

Statistical Analysis

The results were represented as Mean ± SD. The statistical significance was computed using One Way ANOVA followed by Tukeys multiple comparison test and compared with diabetic control group with Standard drug, FD18 where

the n=6 animals in each group were used. P<0.001 was considered statistically significant.

Table 1

Group	Before treatment (Body weight in gms)	After treatment (Body weight in gms)
Normal control (normal saline solution)	183.69±8.16	182.29±7.89
Diabetic control(normal saline solution)	179.73±7.00	171.20±8.27
Standard drug (glibenclamide 4mg/kg p.o.)	176.57±8.70	174.09±8.58
Diabetic + FD18 (100mg/kg.p.o.)	184.92±7.36	182.24±6.73

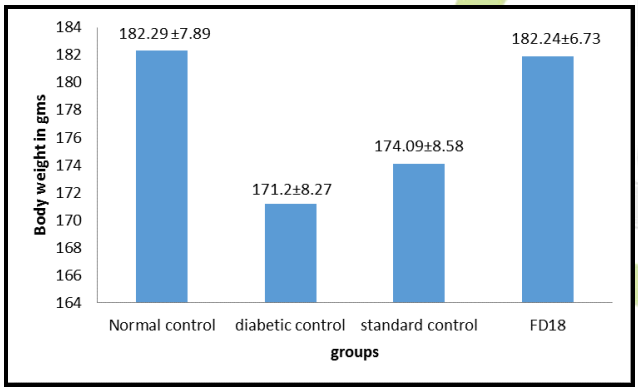

Figure 1: Showing the diagrammatic representation of body weight of the animal groups after 14 days

Table 2

Group	Before treatment (Blood glucose level) mg/dl	After treatment Blood glucose level) mg/dl
Normal control	91.5 ± 8.96	91.17 ± 9.15
Diabetic control (normal saline solution)	281.83±24.72***	321.17 ±20.78***
Standard drug (glibenclamide 4mg/kg p.o.)	302 ±5.88***	100.5 ±4.32[a3]
Diabetic + FD18 (100 mg/kg.p.o.)	313 ±32.37***	122.5 ±8.31[a3]

Values are mean ± SD, n=6 in each group. ***P<0.001 (respectively as compared to normal control); [a3]P <0.001 (as compared to diabetic control). One way ANNOVA followed by Tukeys multiple comparison test.

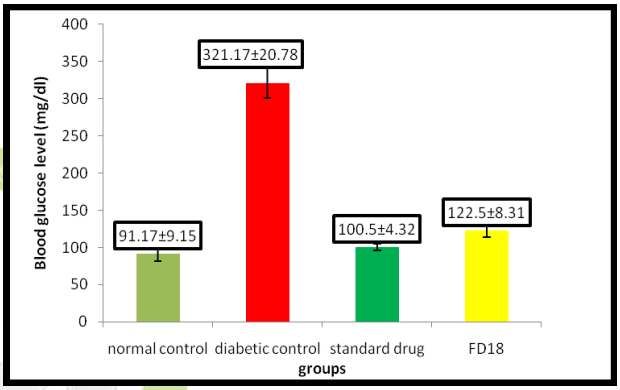

Figure 2: Showing the diagrammatic representation of blood glucose level of the animal groups

RESULTS AND DISCUSSION

The commonly used chemical agent in laboratories for inducing diabetes in animal is alloxan which is an oxidized product of uric acid that causes destruction of beta cells of the pancreas by oxidation mechanism and produce Type 1 diabetes. The present study screened the anti diabetic activity of the polyphyto combination (FD18) against alloxan induced diabetic rats. The continuous treatment of the FD18 was done for a period of 14 days at100mg/kg of body weight. Glibenclamide was the standard drug used to stimulate insulin from beta cells of islets of langerhans many years in research. So, Glibenclamide (4mg/Kg) was selected as standard drug in the study.

The results of the blood glucose level and body weights of the normal control group, diabetic control group, standard group (Glibenclamide

4mg/kg) and trial polyphytocombination (FD18) were summarized in Table No 1 and Table No 2 respectively. Data are statistically obtained by using one way ANNOVA followed by Tukeys multiple comparison test. In Table No.1, the body weight of the normal control is near about same after 14 days. However in diabetic control group was decreased from 179.73±7.00 to 171.20±8.27 after 14 days. The body weight of standard control group is near about same after 14days of treatment. The initial body weight of diabetic FD18 test group is 184.92±7.36, and after 14 days of treatment the bodyweight was about near to182.24±6.73, there was slight increase in body weight found when compared with diabetic control group. The dose of the test polyphyto combination (PD18) on blood glucose level was studied in the animals. The test group showed a significant decrease in blood glucose level on alloxan induced diabetic rats when compared to diabetic control group**.** The initial reading of blood glucose level of FD18 was 313±32.3 before treatment. After the 14 days period FD18 produced significant reduction in the blood glucose levels (122.5**)**. In standard drug group initial blood glucose level was 302±5.88 and the after 14 days it was 93.00±5.47 which showed that the standard drug had produced maximum antidiabetic effect. The diabetic control group showed rise in blood glucose level throughout the study period. Initially the blood glucose level of diabetic control group was 281.83±24.72 and after 14 days of study period the blood glucose level was increased to 321.17 ±20.78. The results of blood glucose level in rats were summarized in Table No.2. And on the basis of the results; it was observed that there was a significant reduction in blood glucose level by polyphyto combination (FD18) in alloxan induced diabetic rats. The anti-diabetic activity of this FD18 could be due to the increased release of insulin from beta cells of the pancreas or may be due to potentiation of the effect of insulin. Treatment of polyphyto combination (FD18) in diabetic rat also showed the significant weight gain property which proved its efficacy of this polyphyto combination in treating diabetic patients successfully.

CONCLUSION

Polyphyto combination (FD18) is a mixture of eight herbal plants and it is found to be more effective in the treatment of diabetes mellitus as determined by its statistically significant p-value < 0.001 in alloxan induced diabetic rats. The mechanism of antidiabetic activity of this polyphyto combination may be due to enhancing the effect of insulin and by stimulating the insulin secretion from beta cells of pancreas. Hence this study suggests that this polyphyto mixture has a potent anti diabetic effect which could be used for the management of diabetes effectively.

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