PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
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Pakistan Journal of Nutrition 8 (3): 239-241, 2009
ISSN 1680-5194

Hypoglycemic Potential of the Young Leave Methanolic Extract of *Magnifera indica* in Alloxan Induced Diabetic Rat

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Abstract: The study was designed to investigate the hypoglycemic potential of *Magnifera indica* young leave methanolic extract in alloxan induced diabetic rat. Albino rats each weighing 100-200g were given a peritoneal injection of 120mg of Alloxan per kg body weight. After 7 days the blood glucose level of the animals were checked to ascertain a diabetic state. Those that were diabetic were selected for the study. Oral administration of *Magnifera indica* leave extract (0.5g/kg body weight) or (1.0g/kg body weight) for 14 days resulted in a significant reduction in blood glucose level from 171.4±4.58 (mg/dl) to 103.7±1.45 (mg/dl) in diabetic rat given 1.0g/kg body weight dose and from 134.2±10.34 (mg/dl) to 97.7±7.01 (mg/dl) in diabetic rat given 0.5g/kg body weight dose, dose dependent being more effective at 1.0g/kg body weight dose than 0.5g/kg body weight dose.

Key words: Hypoglycemic, magnifera indica, diabetes

Introduction

Diabetes mellitus is a common hereditary disease, which causes a high death rate. It is a disorder of metabolism resulting in elevated blood sugar and discharge of large amount of sugar in urine by the patient. This disease has been treated with natural and synthetic product in several countries, it has no cure. Treatment is aimed at controlling the blood sugar of patient so as to prolong the patient's life. (Gill, 1992). A large number of traditional plant treatment had been recorded for diabetes, but few have received scientific and medical evaluation. Medicinal plants have become so important in this present generation in the treatment of numerous types of diseases, (Fola, 1993). The use of medicinal plant is as old as creation and since then the early men through trail and error learned the uses of these plants that serve as food and as remedies for diseases (Kokwaro, 1995). Diabetes mellitus is considered to be a serious endocrine syndrome. In many countries it is traditional to use medicinal plants to control diabetes. The hypoglycemic effect of several plant extracts and herbal formulations, which are used as antidiabetic remedies, has been confirmed (Sharma *et al*., 1992). Synthetic hypoglycemic agents can produce serious side effects including haematological effects, coma and disturbances of the liver and kidney functions. In addition, they are not suitable for use during pregnancy (Larner, 1985). Compared with synthetic drugs, herbal drugs are frequently considered to be less toxic with fewer side effects (Momin, 1987). Therefore, we have now investigated the hypoglycemic potential of *Magnifera indica* young leave methanolic extract in experimental diabetes mellitus.

Materials and Methods

Experimental animals: Female Albino rats (Wistar strain) each weighing 100-200g were obtained from the primate, Biochemistry department, University of Ibadan. They were all fed *ad-liditum* on rat feed manufactured by Ladokun feeds Ibadan. All animals were fasted before the start of the experiment. Each animal for diabetic assay was given a peritoneal injection of 120mg of Alloxan per kg body weight. The blood glucose level of the animals were checked using a glucometer (a one touch test strips) after alloxan injection. The blood glucose level of the animals were again checked after 7 days to ascertain a diabetic state and rats with moderate diabetes were used for the experiment.

Collections and extraction of plants sample: Fresh young leaves of *M. indica* were collected around the environs of the University of Ibadan. The leaves were air dried under laboratory conditions and grinded to powdery form. 560g of the fine powder was packed into the compartment of the soxhlet apparatus/extractor. The solvent (methanol) was then poured into the compartment containing the leaves until it reaches the maximum point. Heat is applied to the apparatus by using the steam bath principle. The solvent vaporizes from the round bottom flask back into soxhlet extractor. The solution in the round bottom flask is then distilled with steam bath and the extract concentrated while the solvent is recovered. The extract was then cooled and poured into a collecting bottle and refrigerated at -20°C till the time of use.

Experimental design: In this experiment a total of 30 rats (20 diabetic surviving rats, 10 normal rats) were used.

Diabetes was induced in rats a week before the start of the experiment. The rats were divided into six group (n=5) after the induction of diabetes.

Group 1: Normal untreated rats.
Group 2: Diabetic untreated rats.
Group 3: Diabetic rats given extract (1000mg/kg body weight) in aqueous solution daily using a canular for 14 days.
Group 4: Diabetic rats given extract (500mg/kg body weight) in aqueous solution daily using a canular for 14 days.
Group 5: Diabetic rats given glibenclamide(600 µg/kg body weight) in aqueous solution in daily using a canular for 14 days.
Group 6: Normal rats given extract(1000mg/kg body weight) in aqueous solution daily using a canular for 14 days.

After 14 days the rats were killed by decapitation. Blood was collected in a tube and centrifuged, the serum was used for the estimation of blood glucose.

Biochemical analysis: Blood glucose was determined using the glucose oxidase method by (Barham and Trinder, 1972). Glucose was estimated by enzymatic oxidation in the presence of glucose oxidase.

Statistical analysis: All the results obtained were expressed as mean±S.D of 5 rats in each group. Statistical significance of difference of means was analyzed by Students t-test. The results were considered statistically significant at $p<0.05$.

Results

Effect of administering *M. indica* leave extract and glibenclamide on body weight in control and experimental diabetic groups is shown in Table 1. Significant weight loss was observed in diabetic rats. Significant weight gain was observed in both normal control and experimental diabetic groups to which *M. indica* extract and glibenclamide were administered. Effect of administering *M. indica* leave extract and glibenclamide on blood glucose in control and experimental diabetic group is shown in Table 2. The blood glucose was significantly increased in diabetic groups when compared with the control group ($P<0.05$). Administration of M. *indica* extract or glibenclamide to diabetic depressed the value near that of the control. The hypoglycemic effect of administration of *M. indica* extract (1000mg/kg) on blood glucose was more pronounce than the administration of glibenclamide on blood glucose.

Discussion

Alloxan known to be a Beta-cytotoxin induces 'chemical diabetes' (alloxan diabetes) in a wide variety of animal species by damaging the insulin secreting cells of the pancreas. Literature sources indicate that alloxan diabetic rats are hyperglycaemic and are under increase oxidative stress (Prince and Menon, 1998). In the present study, the effect of alloxan administration was seen in the elevated glucose levels in all the groups to which it was administered compared to the control. *M. indica* leaves extract, however produced a significant decrease ($P<0.05$) in the glucose level of animals. The untreated diabetic control shows an elevated blood glucose of 58% but administering 1000mg/kg body weight dose of *M. indica* leave extract to diabetic rats reduces glucose level by 39.5% while administering 500mg/kg body weight dose and glibenclamide to diabetic rats brought about 27.2% and 19% reduction in glucose level respectively. When the blood glucose level of the animals to which *M. indica* extract was administered was compared to the control group, it was discovered that the administration of *M. indica* extract tend to bring the blood glucose level of diabetic rat towards the normal control, as does the standard drug glibenclamide. *M. indica* extract, when compared with the standard drug glibenclamide, proved slightly more potent than the drug at 600µg/kg body weight dose. The significant hypoglycemic effect of *M.indica* leave extract may be due to the potentiation of plasma insulin effect by increasing either the pancreatic secretion of insulin from the existing B-cells or its release from the bound form. In the light of the potentiation of plasma insulin, a number of other plants and plants products have been observed to have hypoglycemic effect (Prasanna, 2000).

Administration of *M. indica* leave extract to control group showed a significant decrease in the level of blood glucose. A number of mechanisms could be adduced for the hypoglycemic effect of *M.indica* leave extract. *M.indica* has been found to contain some alkaloid. Solanine an alkaloid found in S. gilo fruit (Rama and Narasimham, 1993) has been associated with improvement in the symptoms of diabetes mellitus (Gupta and Seth, 1962; Chatterjee, 1963). Hence the alkaloids present in *M.indica* may be responsible for its hypoglycemic property. Previous studies show that *A. indica* (Bopanna *et al*., 1997), *C. auriculata* (Satayavati *et al*., 1976) and *M. charantia* (Bever and Zahad, 1979) had antihyperglycemic action in experimental diabetes. An increase glycogenesis was one of the proposed mechanism of action (Perez *et al*., 1998). The antihyperglycemic action of *M.indica* leave extract could be due to the decreased absorption of glucose by the intestine, increased glycolysis, decreased glycogenolysis or enhanced glycogenesis. As it is known that in diabetes, causes and sites of intervention in the biochemical process are diverse and they include, the action of somastostatin, gastrointestinal hormone,

Table 1: Effect of administering *M.indica* leave extract and glibenclamide on body weight in control and experimental diabetic rats

Group	Initial (g)	Final (g)	Change in weight
Control	168±8.37	184±5.48	+16.00
Control+1000mg extract	168±7.58	174±8.94	+06.00
Diabetic	160±1.29	132±1.15	-28.00*
Diabetic+1000mg extract	148±9.08	158±8.37	+10.00 ns#
Diabetic+500mg extract	158±12.55	172±8.33	+14.00 ns#
Diabetic+glibenclamide	156±9.62	170±7.91	+14.00 ns#

Result are express as mean+SEM (n = 5), * = Significantly different from the control group ($p<0.05$), # = Significantly different from the diabetic group ($p<0.05$), ns = Not significantly different from the control group ($p<0.05$).

Table 2: Effect of administering *M.indica* leave extract and glibenclamide on blood glucose in control and diabetic rats

Group	Initial (mg/dl)	Final (mg/dl)
Control	65.5±7.78	70.8±4.24
Control+1000mg extract	73.5±12.02	60.3±9.33*
Diabetic	106.8±8.47	258.2±18.12*
Diabetic+1000mg extract	171.4±4.58	103.7±1.45#
Diabetic+500mg extract	134.2±10.34	97.7±7.01#
Diabetic+glibenclamide	128.2±3.87	103.8±4.05#

Result are expressed as mean+SEM (n = 5), * = Significantly different from the control group ($p<0.05$), # = Significantly different from the diabetic group ($p<0.05$), ns = Not significantly different from the control group ($p<0.05$).

corticosteroids and prostagladins as well as vascular modification of the pancreas and insufficient production of insulin (Akah and Okafor, 1992). It may therefore not be surprising that diversity of action also could apply to the *M. indica* leave extract which have been shown to contain several biologically active constituents.

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