Study Antidiabetic Effect of *Momordica Charantia* (bitter gourd) seeds on Alloxan Induced Diabetic Rats

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Summary

The aim of the present study is to investigate the antidiabetic effect of the aqueous extract of *Momordica charantia* seeds in alloxan - induced diabetic rats. Forty male albino Wistar rats were used, divided randomly into four groups (10 each). Oral administration of the seed extract at a dose of 150 mg/kg B.W. for 30 days showed a significant decrease in fasting blood glucose. Our results were greatly lower after oral administration of aqueous extract of *Momordica charantia* seeds in alloxan- induced diabetic groups than glibenclamide treated group. Also *Momordica charantia* extract and glibenclamide administered rats showed progressive increase in body weight.

دراسة الفعل المضاد للسكري لبذور القرع المر في الجرذان المستحدثة السكري بالالوكسان

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الخلاصة

الهدف من الدراسة هو للاستقصاء عن تاثير الخلاصة المائية لبذور القرع المر ضد مرض السكري في الجرذان التي تم استحداث مرض السكري فيها باستخدام مادة الالوكسان بجرعة 120 ملغم لكل كغم من وزن الجسم. تم استخدام اربعين جرذ مختبري لغرض اجراء التجربة قسمت عشوائيا الى اربعة مجاميع (عشرة جرذان لكل مجموعة). وجد ان اعطاء الخلاصة فمويا وبجرعة 150 ملغم لكل كغم من وزن الجسم لمدة شهر كامل ادت إلى انخفاض معنوي بمستوى سكر الدم مقارنة بعقار الكلبنكلمايد المستخدم روتينيا لعلاج مرضى السكري . كما أدت إلى زيادة في وزن الحيوانات المصابة والمعالجة بالخلاصة مقارنة بوزن الحيوانات المصابة غير المعالجة.

Introduction

The incidence of diabetes is considered to be high worldwide (1).According to the International Diabetes Federation, there are 246 million people with diabetes on the globe and this figure will rise to 380 million by the year 2025 (6) . Diabetes is a group of metabolic disorders that result in hyperglycemia due to decreased insulin production (type-I) or insufficient insulin utilization (type-II) (10). Diabetes mellitus is syndrome, initially characterized by a loss of glucose homeostasis resulting from defects in insulin secretion, insulin action both results in impaired metabolism of glucose and other energy yielding fuels such as lipids and protein (18). The

commonly practiced treatments of diabetes include oral antidiabetic drugs, insulin injections, and management through diet and physical exercise (16). Beside these, people especially in Asian countries still use extracts of different medicinal plants with or with out the advice of Hakims or Ayurvedic practitioners. Few of these medicinal plants have been scientifically investigated. *Momordica charantia*, commonly referred to as bitter gourd belongs to the cucurbitaceae family grows in tropical areas, including parts of the Amazon, east Africa, Asia, and the Caribbean. The Latin name *Momordica* means "to bite" (referring to the jagged edges of the leaf, which appear as if they have been bitten). Bitter gourd contains an array of biologically active phytochemicals including triterpenes, proteins and steroids. Clinically demonstrated hypoglycemic properties (blood sugar lowering) or other actions of potential benefit against diabetes mellitus (15 and 14) by enhancing cells' uptake of glucose (11) promoting insulin release and potentiate the effect of insulin (2 and 17). These hypoglycemic chemicals include a mixture of steroidal saponins known as charantins, insulin-like peptides, and alkaloids.

Materials and Methods

Plant material

Dried seeds of *Momordica charantia* were purchased from a local market in Baghdad and identified in the National Herbarium at Abu-Graib. (Fig.1)

Figure 1: Plant of *Momordica charantia*

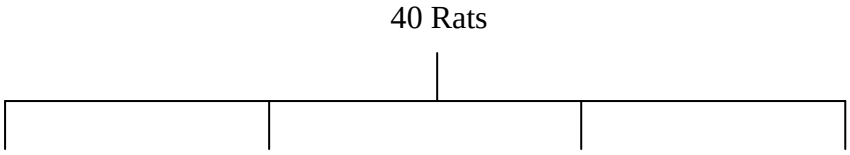
powdered seeds were kept in airtight containers in a deep freeze temperature until the time of further use. The seed extract was prepared by dissolving a known amount of seed powder in distilled water using a magnetic stirrer. It was then filtered and evaporated to dryness under reduced pressure. An aqueous suspension was prepared to facilitate easy handling. The drug suspensions were prepared freshly each time and administered orally. The dosage schedule for the drug was once a day.

Chemicals

Alloxan (Sigma, USA).
Ether (BDH, England).
Glibenclamide 5mg (Medichemie LTD- Cyprus).

Animals and experimental design

Two month old male albino Wistar rats, weighing about 150-200g, were purchased from the animal house of Sera and Vaccines Institute and Biotechnology center at Al-Nahrain University, acclimatized for seven days in our animal house and maintained at standard conditions.



Group A 10 rats	Group B 10 rats	Group C 10 rats	Group D 10 rats
Normal control	Alloxan-induced diabetic rats treated control	Alloxan-induced diabetic rats treated with extract (150mg/kg B.W. /day) in aqueous suspensions orally for 30 days.	Alloxan-induced diabetic rats treated With Glibenclamide (0.07mg/kg B.W /day) in aqueous solution orally for 30 days

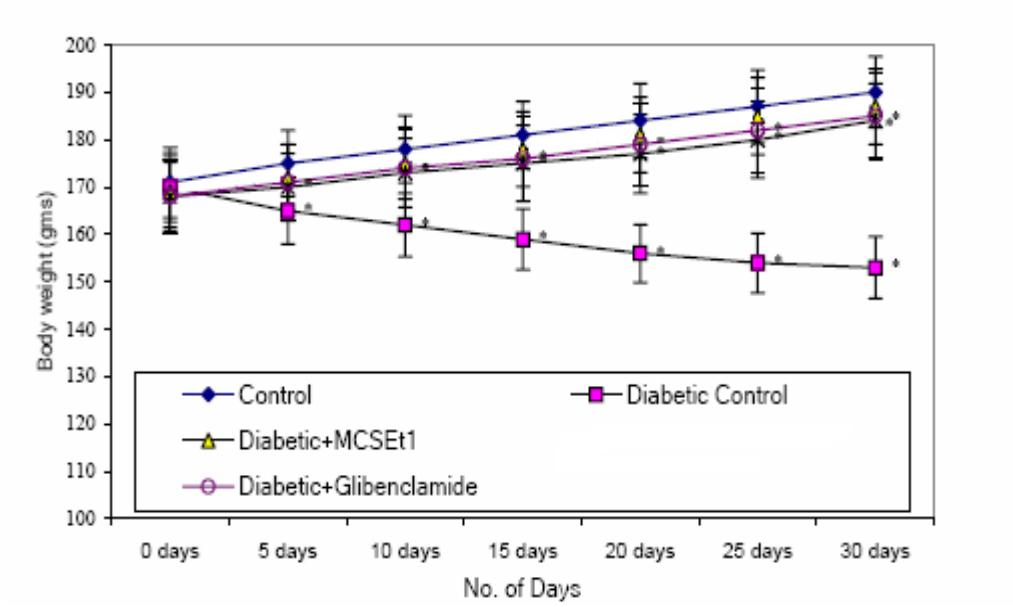
After 30 days of treatment the fasted rats were sacrificed by cervical decapitation and blood was collected with using potassium oxalate and sodium fluoride as anticoagulant for estimation of fasting blood glucose.

Induction of diabetes

Alloxan-induced hyperglycemia has been described as a useful experimental model to study the activity of hypoglycemic agents. Alloxan -induces diabetes via damaging the mitochondria and DNA within the beta cells and irreversible oxidation of SH groups of glucokinase (9). After overnight fasting (deprived of food for 24 hours had been allowed free access to water), diabetes was induced in rats by intraperitoneal injection of alloxan dissolved in 0.1M sodium citrate buffer pH 4.5 at a dose of 120 mg/kg body weight. The control rats received the same amount of 0.1 M sodium citrate buffer. The animals were allowed to drink 5% glucose solution overnight to overcome the drug-induced hypoglycemia. After a week time for the development of diabetes, the rats with moderate diabetes having glycosuria and hyperglycemia (blood glucose range of above 250 mg /dl) were considered as diabetic rats. The change in the body weight was observed throughout the treatment period in experimental animals (13).

Results

Figure 2. Shows the body weight of control and experimental groups of rats. A significant decrease in body weight was observed in alloxan induced diabetic rats (Group B) when compared to the control group of rats (Group A). *Momordica charantia* seeds extract and glibenclamide administered rats (Group C and D) showed progressive increase in body weight.



Control A Diabetic control B Diabetic +Extract C Diabetic +glibenclamide D

Figure 2 Changes in body weight of control and treated groups of rats. Values are given as mean ± SD for groups of 10 animals each. Values are statistically significant at **P*<0.05. Diabetic control rats were compared with normal control rats. Treated groups were compared with diabetic control.

Table 1 shows the fasting blood glucose and urine glucose levels in control and treated groups of rats. There was a significant increase in blood glucose and glycosuria in diabetic control group compared to normal control rats. Administration of *Momordica charantia* seeds extract and glibenclamide tends to bring down the blood glucose concentrations compared to untreated diabetic rats and totally controlled glycosuria.

Table 1. Levels of blood glucose and urine glucose in control and experimental groups of rats.

Groups of Animals	Blood glucose Mg/dl	Urine glucose
Normal control	87.12±3.00	Nil
Diabetic Control	275.18±12.50*	+
Diabetic + extract	92.18±5.00*	Nil
Diabetic + glibenclamide	114.48±12.08*	Nil

Values are given as mean ± SD for groups of six animals each. Values are statistically significant at **P* <0.05; Diabetic control rats were compared with normal control rats. Experimental groups were compared with diabetic control. (+) Indicates more than 2% sugar.

Statistical analysis

Testing methods included one way analysis of variance (ANOVA) followed by least significant difference (LSD) test. P values of less than 0.05 were considered to indicate statistical significance. All results were expressed as mean ± SD for ten animals in each group.

Discussion

The present study was conducted to evaluate the beneficial effects of bitter gourd (*Momordica charantia*) seeds extract in lowering blood glucose in alloxan -induced diabetic rats. Glibenclamide is often used as an insulin stimulant in many studies and also used as a standard antidiabetic drug in alloxan induced moderate diabetes to compare the antidiabetic properties of a variety of hypoglycemic compounds (4). Alloxan -induced diabetes is characterized by severe loss in body weight (3) *Momordica charantia* seeds extract and glibenclamide administration controlled this loss in body weight. However, it did not normalize the body weight completely as it remained lesser than normal control rats. The decrease in body weight observed in diabetic rats might be the result of protein wasting due to unavailability of carbohydrate for utilization as an energy source (5). The hypoglycemic effect of bitter gourd is said to be mediated through an insulin secretogenic effect or through an influence on enzymes involved in glucose metabolism (12). It is suggested that viable beta-cells capable of secreting insulin is required for Momordica charantia to exert its oral hypoglycemic activity (8). The hypoglycemic effect of the extract might be extra-pancreatic either by inhibiting glycogenolysis, hepatic gluconeogenesis and glucose absorption from intestine or by increasing glucose absorption in cells of peripheral tissues (muscle and adipose tissue) and hepatic glycogenesis (7). It's hypoglycemic effect can be attributed to it's biologically active phytochemicals, these chemicals include a mixture of steroidal saponins known as charantins, insulin-like peptides, and alkaloids (14 and 15)

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